NAVIGATION RECTIFIED:

OR, THE *COMMON CHART*

Proved to be the only

TRUE CHART.

By *Peter Blackborow.*

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TO ALL

MEN

That are Studious in

NAVIGATION,

THIS

TREATISE

(Upon the Three Principal Kinds of Sayling, ſo called, wherein there is ſo great diſproportion, that the Queſtion may be asked, what is Truth in *Navigation*? Wherein is proved by Obſervation and Demonſtration, that there is but one Truth in *Navigation*, and that is the Common Chart which is ſo much rejected by all Writers, ſo that all other Poſitions in *Navigation* muſt be rejected; if you will follow that which is Truth)

Is DEDICATED By

Peter Blackborow.

Peter Blackbrow

the Composer is much mistake in his propositions seeing he rejects Mercators Sailing which is prov'd by both Theory and practice to be the only Truth yet attaind to at present

TO THE READER.

NAVIGATION *must depend upon the Magnetick Compass, and the Latitude of places by Observation, otherwise you cannot shape your Course to any place in the World, by the Rumb, and the Right Lines of the Magnetick Compass, and whereas you have three principal kinds of Sailing so called: The Common Chart,* Mercator, *and the Arch of a Great Circle, wherein it will appear there is so great disproportion between the one and the other, that the Question may be asked, which of the three is Truth? There is but*

one Truth in Navigation, and tha
may be always Demonſtrated to be ſo
ſo that although the Earth and Se
are Spherical, I ſhall prove by Obſer
vation, and Demonſtration, that th
Magnetick Compaſs, as it is Horizon
tal, meaſures the Superficies of th
Earth and Sea by Right Lines, a
if the Superficies of the Globe wer
a Plain to the Horizon: Therefore
ſhall firſt reſolve the Queſtion by th
Rumb and the Right Lines of th
Magnetick Compaſs, in a Right-line
Triangle, which is in proportion to the
Common Chart.

Then I ſhall ſhew you how the Me-
ridians and Parallels of places in the
Common Chart, are transferred into the
Meridians and Parallels of the Globe.

Then I ſhall reſolve the ſame
Queſtion by Mercator as is given
in

in the Common Chart, wherein I shall shew you how great the disproportion is between the Meridians of Mercator and the Meridians of the Common Chart: And last of all, I shall shew you wherein the disproportion appears to be a gross errour in Mercator, in mistaking the Meridians of the Magnetick Compass.

Then I shall resolve the same Question by the Arch of a Great Circle, wherein it will appear the Arch of a Great Circle gives a nearer distance than is contained in the Parallels of Latitude, which alters the Angles of Position in the Arch of a Great Circle from the Angles of Position by the Magnetick Compass, that you cannot give the Question from the Practical part of the Sea, but you must alter the Meridians and Paral-

lels of places upon the Globe, ſo tha the Work of Navigation *cannot b performed by the Arch of a Grea Circle, in proportion to the Rum and the Right-lines of the Magnetic Compaſs.*

In the Concluſion it will appear by Obſervation and Demonſtration, that the Common Chart that hath been ſo much rejected by all Writers, is the only Truth in Navigation. *All which I would deſire you to accept with the ſame Candour and Integrity, as it is offered by him, who is,*

A Lover of the

MATHEMATICS,

Peter Blackborow.

NAVIGATION RECTIFIED.

ALL the known part of the World hath been discovered by the Magnetick Compass, and the Latitude of Places by Observation, which doth produce the difference of Longitude, and the distance of places in a Right-lined Triangle: Therefore the Magnetick Compass is of that singular use in *Navigation*, that all Questions must be resolved in proportion to the Rumb and the Right-lines of the Magnetick Compass, otherwise you have no Geome-

Geometrical Demonſtration in *Navigation*: So that all the known parts of the World are laid down in the Common Chart in proportion to the Rumb and the Right Lines of the Magnetick Compaſs.

Then obſerve, the Superficies of the Earth and Sea being Spherical, the Lines of the Globe muſt be Oblique, which differ from the Rumb and the Right-lines of the Magnetick Compaſs and of the Common Chart, therefore there is an abſolute neceſſity to find ſuch proportions from the Globe, as may be in proportion to the Meridians and Parallels of the Common Chart; otherwiſe the Meridians and Parallels of places in the Common Chart, cannot be transferred into the Globe according to the Meridians and Parallels of the Globe: So that all the known part of the World is laid down in the Meridians and Parallels of the Globe from the Meridians and Parallels of the Common Chart, for the difference of Longitude in the Common Chart between places differing in

Lon-

Longitude and Latitude, is proportional to the difference of Meridians in the middle Parallel between ſuch places differing in Longitude and Latitude upon the Globe: And where places in the Common Chart differ in Longitude, being in one and the ſame Parallel, their diſtance is the ſame in the Globe as it is in the Common Chart, for the diſtance is transferred from the Common Chart, to the Globe, notwithſtanding it will appear by the following demonſtrations, that you cannot perform the Work of *Navigation* by the Oblique-lines of the Globe, in regard the Oblique-lines of the Globe differ from the Rumb, and the Right-lines of the Magnetick Compaſs, ſo that the Angles of Poſition in all Oblique-angles differ from the Angles of Poſition by the Magnetick Compaſs. Therefore I ſhall take this method: Firſt, I ſhall reſolve the Queſtion by the Common Chart: Then I ſhall ſhew you how the Meridians and Parallels of places in the Common Chart are transferred into the Meridians and

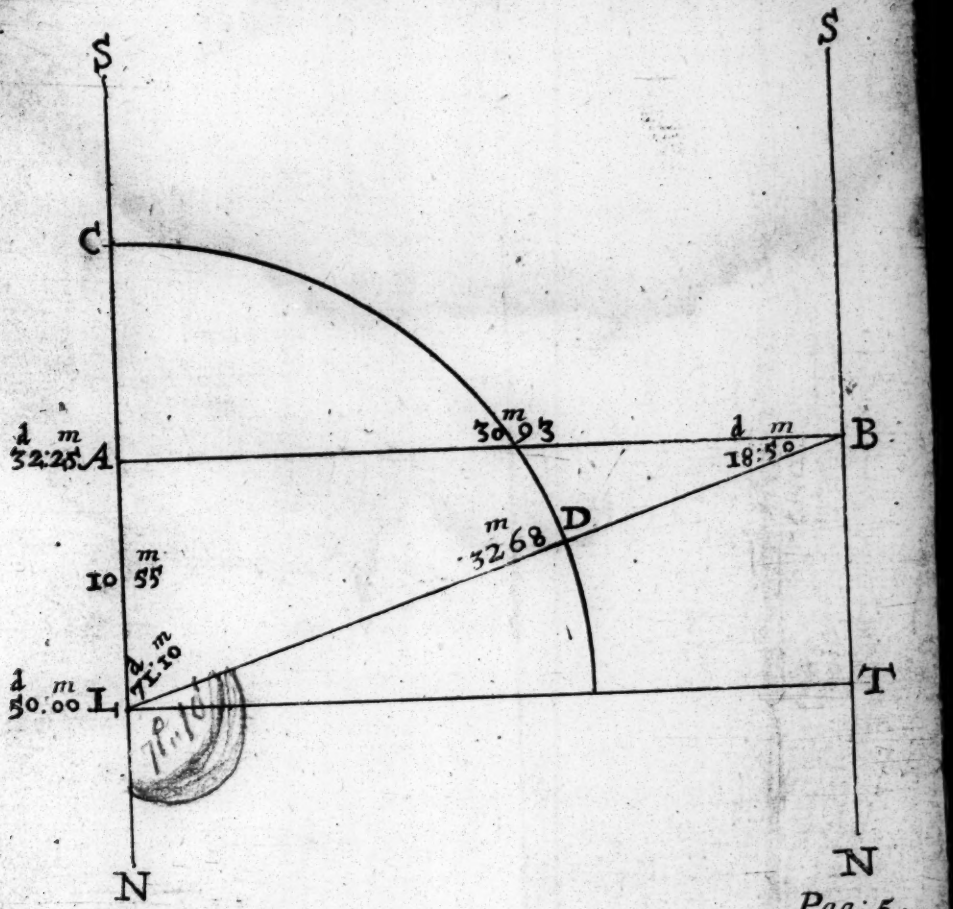
Pa-

Parallels of the Globe, and in the next place I ſhall reſolve the ſame Queſtion by *Mercator*: And laſt of all I ſhall reſolve the ſame Queſtion by the Arch of a Great Circle; all which are the three principal kinds of Sayling ſo called by all Writers; from whence I ſhall prove the Common Chart, that hath been ſo much rejected by all Writers to be the only Truth in *Navigation*, for you muſt Sail by the Rumb and the Right-lines of the Magnetick Compaſs, or the Magnetick Compaſs is of little uſe in *Navigation*.

Firſt, I ſhall reſolve the Queſtion by the Common Chart.

Example.

I ſail from the Meridian and Parallel of the *Lyzard*, in the Latitude of 50 *d.* 00 *m.* in an Angle of 71 *d.* 10 *m.* Southweſtward into the Meridian and Parallel of *Bermudas*, in the Latitude of 32 *d.* 25. *m.* I demand the difference



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rence of Longitude, and the diſtance between the Meridian and the Parallel of the *Lyzard*, and the Meridian and Parallel of *Bermudas*.

The Angle following being a Right-lined Triangle, and is in the like proportion in the Common Chart, ſo is L, the Meridian and Parallel of the *Lyzard*, and B is the Meridian and Parallel of *Bermudas*: Then is L, A, the difference of Latitude, 1055 Miles, and C L D, is the Rumb or Angle of Poſition between the Meridian and Parallel of the *Lyzard* and the Meridian and Parallel of *Bermudas* 71 *d.* 10 *m.* and A B is the difference of Longitude, and L B is the diſtance between the Meridian and Parallel of the *Lyzard* and the Meridian and Parallel of *Bermudas*.

In the following demonſtration, an Inch divided into ten equal parts is to be accounted for 1000 Miles, in regard the diſtance is great, and ſo many equal parts cannot be diſcerned in ſo ſmall a ſpace.

By

By the Geometrical meaſure, the difference of Longitude is A B, 3093 Miles, and the diſtance is L B, 3268 Miles, all which is in like proportion to the Common Chart.

To find the difference of Longitude, the proportions Arithmetical, *As the Radius* 90 d. A B N, 1000000; *is to the Logarithm of the difference of Latitude* 1055 *Miles*, L A, 302325: *ſo is the Tangent of the Rumb* 71 d. 10 m. A, L, B, 1046714. *to the Logarithm of the difference of Longitude* 349039, A B, 3093 Miles. Add the Logarithm of the difference of Latitude, to the Tangent of the Rumb, and Subtract the Radius, and you have the Logarithm of the difference of Longitude 349039, A B, 3093 Miles; ſo that the difference of Latitude and the Rumb by the Magnetick Compaſs, is in proportion in a Right-lined Triangle to the difference of Longitude in the Common Chart.

To find the diſtance, the proportions Arithmetical: *As the Co-ſine of the Rumb* 71 d. 10 m. A, B, L, 950895;

Is

Is to the Logarithm of the difference of Latitude 1055 m. L A, 302325 : *So is the Radius* 90 d. L, A, B, 1000000; *to the Logarithm of the diſtance* 351430, L B, 3268 Miles. Add the Logarithm of the difference of Latitude to the Radius, and Subtract the Co-ſine of the Rumb, and you have the Logarithm of the diſtance 351430, L, B, 3268 Miles; ſo that the difference of Latitude and the Rumb by the Magnetick Compaſs, is in proportion in a Right-lined Triangle, to the diſtance in the Common Chart.

Secondly, I ſhall give the Rumb 71 *d.* 10 *m.* A L B; and the difference of Longitude 3093 *m.* A B; and demand the difference of Latitude L A, and the diſtance L B.

I have already given you the demonſtration of the Geometrical part of all Queſtions, that are to be reſolved between the Meridian and Parallel of the *Lyzard*, and the Meridian and Parallel of *Bermudas*, for as it ſtands in the foregoing demonſtration

it

it is in the like proportion in the Common Chart, therefore I shall proceed to the Arithmetical proportion.

To find the difference of Latitude the proportions Arithmetical; *As the Tangent of the Rumb* 71 *d.* 10 *m.* ALB, 1046714; *Is to the Logarithm of the difference of Longitude* 3093 m. AB, 349037: *So is the Radius* 90 d. ABN, 13000000; *To the Logarithm of the difference of Latitude* 302323, LA, 1055 *m* Add the Logarithm of the difference of Longitude to the Radius, and Subtract the Tangent of the Rumb, and you have the Logarithm of the difference of Latitude 302323, LA, 1055: So that the Rumb, by the Magnetick Compass, and the difference of Longitude is in proportion in a Right-lined Triangle, to the difference of Latitude in the Common Chart.

To find the distance, the proportions Arithmetical: *As the Sine of the Rumb* 71 d. 10 m. ALB, 997610; *Is to the Logarithm of the difference of Longitude* 3093, LA, 349037: *So is the Radius*

ius 90 d. L A B, 1000000; *to the Logarithm of the distance* 351427, L B; 3268 m. Add the Logarithm of the difference of Longitnde to the Radius, and Subtract the Sine of the Rumb, and you have the Logarithm of the distance 351427, L B; 3268 Miles: So that the difference of Longitude, and the Rumb by the Magnetick Compass, is in proportion in a Right-lined Triangle, to the distance in the Common Chart.

Third'y, I shall give you the Rumb A L B, 71 *d.* 10 *m.* and the distance L B, 3268 *m.* and demand the difference of Longitude A B, and the difference of Latitude L A.

To find the difference of Longitude, the proportions Arithmetical: *As the Radius* 90 d. L A B, 1000000; *is to the Logarithm of the distance*, 3268 m. L B, 351428: *So is the Sine of the Rumb* 71 d. 10 m. A L B, 997610; *to the Logarithm of the difference of Longitude* 349038, A B, 3093 m. Add the Logarithm of the distance to the

Sine of the Rumb, and Subtract the Radius, and you have the Logarithm of the difference of Longitude, 349038, AB, 3093 *m.* so that the Rumb and the distance by the Magnetick Compass, is in proportion in a Right-lined Triangle, to the difference of Longitude in the Common Chart.

To find the difference of Latitude, the proportions Arithmetical: *As the Radius* 90 d. LAB, 1000000, *is to the Logarithm of the Distance* 3268 m. LB, 351428: *So is the Co-sine of the Rumb* 71 d. 10 m. ABL, 950896, *to the Logarithm of the difference of Latitude*, 302323, LA, 1055 *m.* Add the Logarithm of the distance to the Co-sine of the Rumb, and Subtract the Radius, and you have the Logarithm of the difference of Latitude 302323, LA, 1055 *m.* So that the Rumb, and the distance by the Magnetick Compass, is in proportion to the difference of Latitude in the Common Chart.

Fourthly, I shall give the difference of

of Latitude L A, 1055 *m.* and the difference of Longitude A B, 3093 *m.* and demand the Rumb by the Magnetick Compaſs A L B.

To find the Rumb by the Magnetick Compaſs, the proportions Arithmetical: *As the Logarithm of the difference of Latitude* 1055 m. L A, 302325, *is to the Radius* 90 d. A B N, 1000000; *So is the Logarithm of the difference of Longitude* 3093 *m.* A B, 349037; *to the Tangent of the Rumb* 1046712; A L B, 71 d. 10 m. Add the Radius to the Logarithm of the difference of Longitude, and Subtract the Logarithm of the difference of Latitude, and you have the Tangent of the Rumb, 1046712; A L B, 71 *d.* 10 *m.* So that the difference of Latitude, and the difference of Longitude, is in proportion to the Rumb, by the Magnetick Compaſs, in the Common Chart.

Fifthly, I ſhall give the difference of Latitude L A, 1055 *m.* and the diſtance L B, 3268 Miles, and

demand the Rumb by the Magnetick Compaſs.

To find the Rumb by the Magnetick Compaſs, the proportions Arithmetical: *As the Logarithm of the diſtance* 3268 m. LB, 351428, *is to the Radius* 90 d. LAB, 1000000; *ſo is the Logarithm of the difference of Latitude* 1055 m. LA, 302325; *to the Co-ſine of the Rumb* 950897, ABL, 18 d. 50 m. *whoſe Complement is* 71 d. 10 *m.* ALB. So that the difference of Latitude and diſtance of places, is in proportion to the Rumb, by the Magnetick Compaſs in the Common Chart. Add the Logarithm of the difference of Latitude to the Radius, and Subtract the Logarithm of the diſtance, and you have the Coſine of the Rumb 950897, ABL, 18 *d.* 50 *m.* whoſe complement is 71 *d.* 10 *m.* ALB, demanded.

Sixthly, I ſhall give the difference of Longitude 3093 *m.* AB; and the diſtance 3268 *m.* LB. and demand the Rumb by the Magnetick Compaſs.

To

To find the Rumb by the Magnetick Compaſs, the proportions Arithmetical: *As the Logarithm of the diſtance* 3268 m. LB, 351428; *is to the Radius* 90 d. LAB, 1000000: *So is the Logarithm of the difference of Longitude* 3093 m. AB, 349037; *to the Sine of the Rumb* 997609, ALB, 71 d. 10 m. Add the Radius to the Logarithm of the difference of Longitude, and Subtract the Logarithm of the diſtance, and you have the Sine of the Rumb 997609, ALB, 71 *d.* 10 *m.* So that the difference of Longitude, and the diſtance is in proportion to the Rumb in the Common Chart.

Seventhly, I ſhall give the difference of Longitude 3093 *m.* AB, and the diſtance 3268 *m.* LB, and demand the difference of Latitude LA.

To find the difference of Latitude, the proportions Arithmetical: Add the difference of Longitude 3093 m. to the diſtance 3268 m. and you have 6361 Mil. for the ſum of the ſides; then Subtract the difference of Longitude

from the distance, and you hav
175 Miles for the difference of th
sides; so take the Logarithm of th
sum of the sides A B, L B, 6361 Mile
380352; and the Logarithm of th
difference of the sides 175 Miles
224303: Add them together, an
you have 604655, the half is 302327½
which is the Logarithm of the diffe
rence of Latitude 1055 *m.* L A. S
that the difference of Longitude, an
the distance is in proportion in a Righ
lined Triangle, in the Common Chart.

Eighthly, I shall give the differenc
of Latitude L A, 1055 *m.* and th
distance L B, 3268 *m.* and demand th
difference of Longitude.

To find the difference of Longitude
the proportions Arithmetical; Ad
the difference of Latitude 1055 *m.* to
the distance 3268 *m.* and you have
4323 Miles for the sum of the sides,
then Subtract the difference of Lati-
tude from the distance, and you have
2213 Miles for the difference of the
sides: So take the Logarithm of the
sum

ha sum of the ſides 4323 Miles, L A, L B,
f th 63578; and the Logarithm of the
f th difference of the ſides, 2213, 334498:
Iile Add them together, and you have
f th 698076, the half is 349038, which is
iles the Logarithm of the difference of
an Longitude 3093 Miles, A B: So that
27½ the difference of Latitude, and the
liff diſtance is in proportion in a Right-
S lined Triangle, in the Common
an Chart.
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art I have proved by the foregoing
Queſtions, that the Rumb and the
nc Right-lines of the Magnetick Compaſs,
th agree with the Rumb and the Right-
th lines of the Common Chart, from
hence may ariſe an objection, how the
de Right-lines of the Magnetick Compaſs
dc can meaſure the Superficies of the
to Globe, which is ſpherical? To anſwer
ve this objection, I will grant you to be
es, in any Meridian and Parallel of the
ti- World, wherein you muſt ſee 180 *d.*
ve of Heaven, for it is 90 *d.* from your
ne Zenith every way to the Horizon, then
e the Circulation of the Horizon muſt
n

contain 360 *d.* To this I compare the Magnetick Compaſs, which contains 360 *d.* and is Horizontal to the Horizon always, in all Meridians and Parallels of the World; So that the North and South, and the Eaſt and Weſt Points of the Magnetick Compaſs, point to the Celeſtial Poles of North and South, and to the Celeſtial Poles of Eaſt and Weſt, in all Meridians and Parallels of the Earth and Sea, without giving any difference of obſervation for the Semidiameter of the Earth and Sea; then the Meridians of the Magnetick Compaſs, muſt run parallel to the Poles of Eaſt and Weſt, as the parallels of Latitude run parallel to the Poles of North and South; therefore the Magnetick Compaſs being of Right-lines, meaſures the Superficies of the Globe by Right-lines, as if the Superficies of the Globe was always a Plain to the Horizon; ſo that whatever poſition doth diſagree with the Rumb and the Right-lines of the Magnetick Compaſs muſt be a falſe poſition

are then in Navigation, for the work of
ntain avigation muſt be performed by the
ne Magnetick Compaſs, and the Latitude
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at the eans all the known parts of the
t and World have been diſcovered, and laid
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art iſtance of places in the Common
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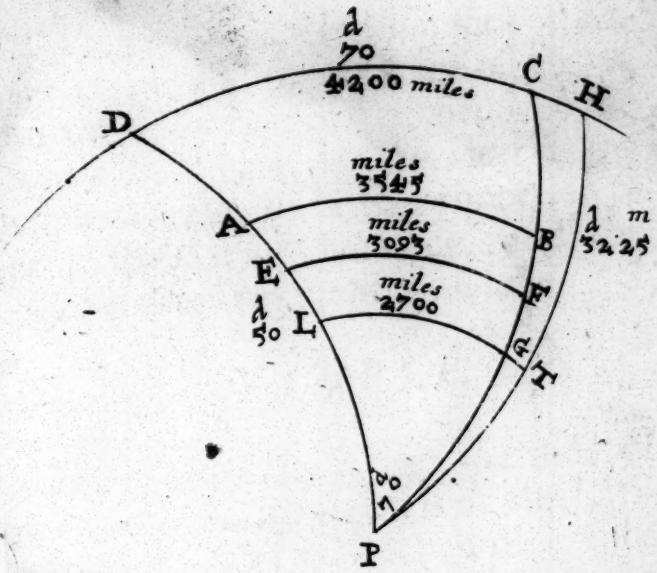
he diſtance of places upon the Globe;
ick wherein I ſhall prove by demonſtra-
the tion, that the Meridian of the Magne-
ba- tick Compaſs doth differ from the
to Meridians of the Globe, as they are
re- drawn.
of To prove how the difference of La-
es titude, and the diſtance of places, and
ne the difference of Longitude in the
a Common Chart, is transferred from
- the Common Chart, to be in pro-
e portion by Demonſtration to the
difference of Latitude, and the diſtance
of places upon the Globe:

In

In the foregoing Queſtion, by the Common Chart, the *Lizard* is in the Latitude of 50 *d.* 00 *m.* the *Bermudus* is in the Latitude of 32 *d.* 25 *m.* their difference of Latitude is 1055 *m.* or 17 *d.* 35 *m.* and the difference of Longitude is 3093 *m.* or 51 *d.* 33 *m.* and the diſtance is 3268 *m.* or 54 *d.* 28 *m.* before I proceed to the demonſtration upon the Globe, you may obſerve the difference of Longitude in all Right-lined Triangles, is in proportion to the difference of Longitude in the middle parallel of the Globe, between ſuch places differing in Longitude and Latitude, in all Meridians and parallels of the World.

The Demonſtration follows, P the North Pole, D A the Latitude of *Bermudus*, A B a parallel of the Latitude of *Bermudus*, A P the complement of the Latitude of *Bermudus*, E F the difference of Longitude, found by the foregoing Right-lined Triangle, which is in proportion to the middle parallel upon the Globe; D L the Latitude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Latitude of the *Lyzard*, L G a parallel of the Latitude of the *Lyzard* L P, the complement of the Latitude of the *Lyzard*, P D is the Meridian of the *Lyzard*, P C is the Meridian of *Bermudus*, D P C is the difference of Longitude of the Æquinoctial.

TO prove how the difference of Latitude, and the distance of places, and the difference of Longitude in the Common Chart is transferr'd by demonstration, to be in proportion to the difference of Latitude, and the distance of places upon the Globe.

EXAMPLE.

The *Lyzard* is in the Latitude of 50 *d.* 00 *m.* L. *Bermudus* is in the Latitude of 32 *d.* 25 *m.* B, their difference of Latitude is A L, 17 *d.* 35 *m.* the half thereof is 08 *d.* 47 *m.* 30 *sec.* which being added to D A, 32 *d.* 25 *m.* the Latitude of *Bermudus*, you have D E, 41 *d.* 12 *m.* 30 *sec.* the Latitude of the middle parallel between the *Lizard* and

and *Bermudus*, then reduce the di
rence of Longitude found by the fo
going Right-lined Triangle, betwe
the Meridian and parallel of the *Lyza*
and the Meridian and parallel of *B*
mudus, 3093 *m.* into Degrees of t
Æquinoctial, by dividing 3093
by 60 *m.* and you have 51 *d.* 33
which diſtance being taken by yo
Compaſs, from the Æquinoctial pa
of the Globe, and meaſuring tha
diſtance in the middle parallel E
41 *d.* 12 *m.* 30 *ſec.* you will find tha
diſtance 51 *d.* 33 *m.* to reach from th
Meridian of the *Lyzard*, to the Meri
dian of the *Bermudus*, in the paralle
of 41 *d.* 12 *m.* 30 *ſec.* which is th
ſame diſtance in the Common Chart
ſo that the *Lyzard* muſt be laid down
upon the Globe, in the Meridian o
the middle parallel D E P, and in the
Latitude of 50 *d.* 00 *m.* at L, and *Ber-*
mudus muſt be laid down upon the
Globe in the Meridian of the middle
parallel C E P, and in the Latitude of
32 *d.* 25 *m.* at B.

In

In the next place, I ſhall ſhew you how to find the diſtance by the Geometrical part of the Globe, to be in proportion to the diſtance found by a right-lined Triangle between the Meridian and parallel of the *Lyzard*, and the Meridian and parallel of *Bermudus*.

EXAMPLE.

Reduce the diſtance found by a right-lined Triangle 3268 *m.* by 60 *m.* into degrees of the Æquinoctial, by dividing 3268 *m.* by 60 *m.* and you have ·54 *d.* 28 *m.* which diſtance being taken by your Compaſs, from the Æquinoctial part of the Globe, that diſtance will reach from the Meridian and parallel of the *Lyzard* L, to the Meridian and parallel of *Bermudus* B, ſo that the diſtance between the Meridian and parallel of the *Lyzard*, and the Meridian and parallel of *Bermudus*, is the ſame in the Globe as it is in a Right-lined Triangle.

Having proved how the difference of Latitude, and the diſtance of places,

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and the difference of Longitude in the dia
Common Chart, is transferred from the d
Common Chart, to be in proportio 54
by demonſtration to the difference of t
Latitude, and the difference of Longi eri
tude in the middle parallel, and the nd
diſtance of places on the Globe: ud

In the next place, you may obſerve hat
the difference of Longitude in the Glo
Globe, between the Meridians of the ara
middle parallel 41 *d.* 12. *m.* 30 *ſec.* f
E F, is 3093 *m.* or 51 *d.* 33 *m.* And no
the difference of Longitude in the Me
Æquinoctial part of the Globe, between an
thoſe Meridians D C is 4200 *m.* or Be
70 *d.* 00 *m.* and the difference of Lon- po
gitude between thoſe Meridians, in re
the parallel of *Bermudus*, A B, is of
3545 *m.* or 59 *d.* 05 *m.* and the diffe- fo
rence of Longitude, between thoſe N
Meridians in the parallel of the p
Lyzard L G is 2700 Miles, or 45 *d.* d
00 *m.* all which diſtances may be g
meaſured upon the Globe; from
whence you may make this obſer-
vation, that the difference of Longi-
tude in the Globe, between the Me-
ridian

n th dian and Parallel of *Bermudus* B,
n th d the Meridian of the *Lyzard* A B, is
rtic 545 *m.* or 59 *d.* 05 *m.* and the diſtance
ce by the Common Chart, between the
ngi eridian and Parallel of the *Lyzard*,
th nd the Meridian and parallel of *Ber-*
udus, is 3268 *m.* or 54 *d.* 28 *m.* So
rv hat the difference of Longitude in the
th Globe, between the Meridian and
the arallel of *Bermudus*, and the Meridian
ſec f the *Lyzard* is 277 *m.* or 04 *d.* 37 *m.*
nd more than the diſtance between the
he Meridian and parallel of the *Lyzard*,
en and the Meridian and Parallel of
or *Bermudus*, which is out of all pro-
n portion to the Rumb, and the diffe-
n rence of Longitude and the diſtance
s of places in a Right-lined Triangle;
for the difference of Longitude in
Navigation, by the Magnetick Com-
paſs cannot be greater than the
diſtance: So that the work of Navi-
gation cannot be performed by the
Globe, before you have found ſuch
proportions upon the Globe, which
are in proportion to the Rumb, and
the Right-lines of the Magnetick
Compaſs,

Compaſs, as the Queſtion hath b
transferr'd to the Globe from
Common Chart.

In the next place I ſhall give
the Arithmetical proportions of
Globe, which are in proportion
the Geometrical part.

The *Lyzard* is in the Latitude
50 *d.* 00 *m.* L, *Bermudus* is in
Latitude of 32 *d.* 25 *m.* B, their di
rence of Longitude in the Æquinoct
part of the Globe is 70 *d.* 00 *m* D
I demand the difference of Longitu
in the middle parallel E F.

To find the Logarithm of the dif
rence of Longitude, between the M
ridian and Parallel of the *Lyzard*, a
the Meridian of *Bermudus* L G, t
proportion Arithmetical: *As the R
dius* 90 d. P D, 1000000, *is to the L
garithm of the difference of Longitu
in the Æquinoctial*, 70 d. 00 m.
4200 m. D C, 362324; *ſo is the C
ſine of the Latitude of the* Lyzard 40
00 *m.* P L, 980806, *to the Logarith
of* L G, 343130. Add the Logarithm
of the difference of Longitude

e Æquinoctial to the Co-sine of the
titude, and Subtract the Radius, and
u have the Logarithm of the diffe-
nce of Longitude between the Me-
dian and parallel of the *Lyzard*, and
e Meridian of *Bermudus*, L G,
43130, or 2700 *m.*

To find the Logarithm of the diffe-
nce of Longitude between the Meri-
an and parallel of *Bermudus*, and the
eridian of the *Lyzard*, B A, the pro-
ortions Arithmetical: *As the Radius*
0 d. 00 m. P D, 1000000; *is to the*
ogarithm of the difference of Longitude
the Æquinoctial, 70 d. 00 m. *or*
200 m. D C, 362324: *So is the Co-*
ne of the Latitude of Bermudus 57 d.
5 m. A P, 992643; *to the Logarithm of*
A B, 354967: Add the Logarithm
f the difference of Longitude in the
Equinoctial, to the Co-sine of the
atitude, and Subtract the Radius, and
ou have the Logarithm of the diffe-
ence of Longitude, between the Me-
idian and parallel of *Bermudus*, and
he Meridian of the *Lyzard*, A B,
354967, or 3545 *m.*

Then add the Logarithm of 34
found in proportion, to 70 *d.* 00
Longitude, in the parallel of
00 *m.* to the Logarithm of 354
found in proportion to 70 *d.* 00
Longitude, in the parallel of
25 *m.* and you have 698097, the
is 349048½, which is the Logari
of the difference of Longitude in
middle parallel, between the Meri
and parallel of the *Lyzard* and the
ridian and parallel of *Bermudus*,
3093 *m.* or 51 *d.* 33 *m.* So that the
portions Arithmetical do agree w
the proportions Geometrical, wher
you have the middle parallel 3093
the proper difference of Longitude,
which the difference of Latitude, a
the distance upon the Globe, is in l
proportion in the common Chart.

Last of all, I shall give the Questi
from the difference of Longitu
in a Right-lined Triangle, and the L
titude of the *Lyzard* and *Bermud*
and demand the difference of Lo
gitude in the Æquinoctial part of th
Globe.

Exampl

EXAMPLE.

Sail from the *Lyzard* in the Lati-
e of 50 *d.* 00 *m.* L, between the
th and the West, in the Latitude
2 *d.* 25 *m.* B, I find my difference
Longitude in a Right-lined Tri-
le, 3093 *m.* I demand the diffe-
ce of Longitude in the Æquinoctial
t of the Globe, between the Me-
an of the *Lyzard* and the Meri-
n of *Bermudus.*

To find the difference of Longitude
the Æquinoctial, the proportions
thmetical: *As the Co-sine of the*
titude of the Lyzard, 40 d. 00 m.
, 980806; *is to the Logarithm of*
difference of Longitude in the middle
allel of the Globe, 3093 m. E F,
9037: *So is the Radius* 90 d. 00 m.
D, 1000000; *to the Logarithm of*
8231: Add the Logarithm of the
ference of Longitude in the middle
rallel to the Radius, and Subtract
e Co-sine of the Latitude, and you
ve the Logarithm of 368231,

which muſt be added to the n
proportion.

Then, *As* the Co-ſine of the Latitu
of *Bermudus*, 57 *d.* 35 *m.* P A, 99264
is to the Logarithm of the differe
of Longitude in the parallel of t
Globe, 3093 *m.* E F, 349037: *So*
the Radius 90 *d.* 00 *m.* P D, 100000
to the Logarithm of 356394: A
the Logarithm of the difference
Longitude in the middle parallel,
the Radius, and Subtract the Co-ſi
of the Latitude, and you have t
Logarithm of 356394:

Then add the Logarithm of 36823
(found in proportion to 3093 *m.*
Longitude in the parallel of 50 *d.* 00 *m*
to the Logarithm of 356394, (found
proportion to 3093 *m.* of Longitude,
the parallel of 32 *d.* 25 *m.*) and yo
have 724625; the half is 362312
which is the Logarithm of the diffe
rence of Longitude in the Æquinoctia
part of the Globe, 4200 *m.* D C de
manded: So that the proportions A
rithmetical agree with the propor
tions Geometrical, therefore the

difference

ifference of Longitude in the middle
aralleb of the Globe, is the proper
ifference of Longitude 3093 *m.* in
roportion to the Rumb, by the Mag-
etick Compaſs.

I have done with the firſt Queſtion
in the Common Chart between places
differing in Longitude and Latitude,
wherein I have proved how the Meri-
dians and parallels of the common
Chart differing in Longitude and La-
titude, are transferr'd by Demonſtra-
tion, in proportion to the difference of
Latitude, and the diſtance of places
upon the Globe.

Laſt of all, I ſhall ſhew you how to transferr the difference of Longitude in one and the ſame Latitude in the Common Chart, into the Meridians and parallels of the Globe.

EXAMPLE.

In the Common Chart in the Latitude of 50 *d.* 00 *m.* the difference of Longitude is 3093 *m.* L T, I demand

the difference of Meridians in t
Æquinoctial part of the Globe.

To find the difference of Longitu
in the Æquinoctial part of the Glob
the proportions Arithmetical: *As t*
Co-sine of the Latitude 40 d. 00 m. P
980806, *is to the Logarithm of the diff*
rence of Longitude, in the parallel
50 d. 00 m. L T, 3093 m. 349037
so is the Radius 90 d. P D, 1000000
to the Logarithm of 368231; *which*
the Logarithm of D H, 4812 Miles,
80 d. 12 m. *the difference of Meridian*
in the Æquinoctial part of the Globe

So that the Meridians of the Glob
being oblique, do differ from the
Meridians of the Common Chart tha
are Right-lined; but the distance o
places in the Globe are the same in the
Common Chart, in regard the distance
of places is transferr'd from the
Common Chart to the Globe, there-
fore the superficies of the Common
Chart in all Meridians and parallels,
is in proportion to the superficies of
the Globe in all Meridians and Pa-
rallels.

And

AND whereas all Writers in Navigation, have condemned the common Chart to be peſtered with notorious errours, it proves a great miſtake; therefore I ſhall anſwer the principal objection, and in that I anſwer all the reſt.

Mr. *Edward Wright* in his *Correction of Errours in the Common Chart, Fol.* 5. ſaith, "In ſhewing the diſtance of places, there is as great an errour committed as in any of the former.

For Example,

If you imagine two Ships to be under the Æquinoctial 100 Leagues aſunder, and that each of them ſhould Sail from thence due North or South, under his Meridian, untill they come to the parallel of 60 *d.* Latitude, they ſhould be there but only 50 Leagues diſtant, becauſe at that Parallel, the Meridians are diſtant but half ſo much one from another, as they were at the Æquinoctial, as it may moſt mani-

festly appear by the Globe, and by the Chart will shew, that those two Ships have the self-same distance 100 Leagues, being under the Parallel of 60 degrees, which they have before when they were under the Æquinoctial.

It is granted, that the difference of Meridians in the Common Chart, is 100 Leagues in the Equinoctial, and 100 Leagues in the Parallel of 60 Degrees.

In regard it appears by observation by the Magnetick Compass, that the East and West point of the Magnetick Compass as it is Horizontal, does always point to the Poles of East and West in the Celestial Sphere, likewise the North and South point of the Magnetick Compass, as it is Horizontal, does always point to the Poles of North and South in the Celestial Sphere, in all Meridians and Parallels of the Terrestial Sphere, without making any difference of observation for the Semi-Diameter of the Earth: And whereas it appears by observation, that the

Magnetick

and Magnetick Compaſs in its true Poles
ſe will direct you the Circulation of the
nce Earth and Sea, in any Parallel of
he Latitude, keeping an equal diſtance
y from the Poles of North and South;
r the likewiſe it muſt be granted that the
Meridians of the Magnetick Compaſs,
nce muſt run Parallel to the Poles of
t, Eaſt and Weſt, the Circulation of the
an Earth in all Parallel Meridians, in
f 6 regard the Magnetick Compaſs as it is
Horizontal, makes the ſame poſition
tion to the Poles of North and South in the
the Celeſtial Sphere, and to the Poles of
tic Eaſt and Weſt in the Celeſtial Sphere,
al in all Meridians and Parallels of the
W Terreſtial Sphere, without making
the any difference of obſervation for the
he Semi-Diameter of the Earth; So
es that the Meridians do croſs the Pa-
th rallels of the Magnetick Compaſs at
in Right-Angles, in all Meridians and Pa-
r- rallels of the Earth and Sea, as it is
y by demonſtration in the Common
- Chart: Therefore the Magnetick
s, Compaſs as it is Horizontal, muſt
e, meaſure the ſuperficies of the Ter-
reſtial

reſtial Sphere by Right-lines, as if t
Superficies of the Terreſtial Sphe
was a plain to the Horizon; ſo that
you imagine two Ships to be under t
Æquinoctial 100 Leagues aſunder, a
that each of them ſhould Sail fro
thence due North, or due South, und
his Meridian, untill they come to th
Parallel of 60 *d.* Latitude, they mu
be 100 Leagues diſtant; in regard th
Meridians of the Magnetick Compaſ
muſt run Parallel to the Poles o
Eaſt and Weſt, as the Eaſt and We
points of the Magnetick Compaſs ru
Parallel to the Poles of North an
South, I ſhall treat more at large o
this in its due place.

I have given you the Geometrical
demonſtration, and the Arithmetical
rules, how all places in the Common
Chart are transferr'd into the Meri-
dians and Parallels of the Globe;
therefore you cannot reſolve any
Queſtion in Navigation from the
Globe, without you have ſuch pro-
portions from the Globe as are in pro-
portion to the Rumb, and the Right-
lines of the Magnetick Compaſs.

The

The ſam: Queſtion reſolved by Mercator's *Projection.*

MR. *Edward Wright* in his *Projection of Mercators Plain-Sphere*, doth undertake the ſuperficies of the Globe as a plain to the Horizon, and doth meaſure the Parallels of the Globe, in proportion to the degrees of the Æquinoctial upon the North and South Poles; ſo that all the Parallels in *Mercator*'s Plain-Sphere, are of equal Diameter to the Poles. Then *Mercator* divides the Meridian Line into unequal parts, and both increaſe the degrees and minutes of Latitude from the Æquinoctial to the Poles, to almoſt an endleſs proportion: Therefore at every point of Latitude in his Plain-Sphere, the difference of Meridians doth ſo increaſe, that taking half a degree above a point of Latitude, and half a degree below the Latitude, that diſtance is to be a degree of Longitude in that Latitude; ſo that the deſign of *Mercator*'s Plain-Sphere is to meaſure the difference

of

of Meridians, in proportion to the di
rence of Meridians upon the Glo

The Queſtion to be reſolved
Mercator. The *Lyzard*, Latitude 50
00 *m*. *Bermudus*, Latitude 32 *d*. 25
their difference of Longitude in t
Æquinoctial 70 *d*. 00 *m*. I demand t
Rumb by the Magnetick Compaſs.

This Queſtion cannot be reſolved
any Geometrical demonſtration,
regard I have not the difference
Longitude in proportion to the Rum
by the Magnetick Compaſs, for
Right-lined Triangle muſt be of equ
parts, otherwiſe the difference of L
titude and the difference of Longitud
cannot be in proportion to th
diſtance of places upon the Rum
by the Magnetick Compaſs, neithe
can this Queſtion be reſolved by th
Arch of a great Circle, in regar
the Angles of Poſition in all obliqu
Angles, differ from the Angles of poſi
tion by the Magnetick Compaſs; ſo
that *Mercator* hath no way to find the
Rumb from the Queſtion given, but
brief Rules in Arithmetick, which are
near

ear a proportion to the Rumb by he Magnetick Compaſs, but when the iſtance between the Meridian and arallel of the *Lyzard*, and the Meridi- n and Parallel of *Bermudus*, and the ifference of Longitude is required in Right-lined Triangle, to be in pro- portion to the Rumb, by the Magnetick Compaſs, and the difference of Latitude hen all *Mercator's* brief Rules in Meri- dional parts, and the difference of Lon- gitude in the Æquinoctial are rejected.

TO reſolve the Queſtion by *Mer- cators* brief Rules, you muſt firſt find the Meridional parts contained between the difference of Latitudes.

EXAMPLE.

The meridional parts contained in the Latitude of 50 *d.* 00 *m.* are 3475, the meridional parts contained in the Latitude of 32 *d.* 25 *m.* are 2058, then Subtract the leſſer from the greater and you have 1417, the Meridional parts contained in the difference of Latitude; then multiply 70 *d.* 00 *m.* of Longitude by 60 *m.* and you have 4200 *m.* the difference of Longitude

in

in the Æquinoctial. To find the Rumb by *Mercators* brief Rules, *As the Logarithm of the difference of Latitude in Meridional parts*, 1417 — 3151136, *is to the Radius* 90 — 1000000; *So is the Logarithm of the difference of Longitude in the Æquinoctial* 4200 m. 362324, *to the Tangent of the Rumb* 71 d. 21 m. 1047188. So that *Bermudus* doth bear from the *Lyzard* in an Angle of 71 *d.* 21 *m.* South-Westwards: Add the Radius to the difference of Longitude in the Æquinoctial, and Subtract the Meridional parts contained in the difference of Latitude, and you have the Tangent of the Rumb 71 *d.* 21 *m.* 1047188.

The second Question to be resolved by *Mercators* brief Rules; the difference of Latitude between the *Lyzard* and *Bermudus*, in Meridional parts is 1417, and the Rumb is an Angle of 71 *d.* 21 *m.* South-Westwards, I demand the difference of Longitude in the Æquinoctial.

To

To find the difference of Longitude the Æquinoctial, say, *As the Radius* d. 1000000, *is to the Logarithm of e difference of Latitude in Meridional rts* 1417, 315136; *so is the Tangent the Rumb* 71 d. 21 m. 1047171, *to e Logarithm of the difference of Longi- de in the Æquinoctial* 4198 Miles, 362307: Add the Logarithm of the eridional parts contained in the diffe- ence of Latitude, to the Tangent of he Rumb, and Subtract the Radius, nd you have the Logarithm of the ifference of Longitude in the Æqui- octial, 4198*m.* 362307 demanded.

The third Queſtion to be reſolved y *Mercators* brief Rules; the diffe- rence of Longitude in the Æqui- noctial, between the Meridian of the *Lyzard*, and the Meridian of *Bermudus*, 4200 *m.* The Rumb is an Angle of 71 *d.* 21 *m.* South-Weſtwards, I de- mand the difference of Latitude in Meridional parts.

To find the difference of Latitude in Meridional parts, ſay, *As the Tangent of the Rumb* 71 d. 21 *m.* 1047171, *is*

is to the Logarithm of the difference of Longitude in the Æquinoctial 4200 m. 362324; *so is the Radius* 90d. 100000 *to the Logarithm of the difference of Latitude in Meridional parts,* 1417 m. 315153 : Add the Logarithm of the difference of Longitude in the Æquinoctial, to the Radius, and Subtract the Tangent of the Rumb, and you have the Logarithm of the difference of Latitude in Meridional parts, 1417 m. 315153 demanded.

The Fourth Question to be resolved by *Mercator*'s brief Rules. The difference of Latitude as it is upon the Globe 1055 *m.* and the difference of Latitude in Meridional parts 1417 ; and the difference of Longitude in a Right-lined Triangle, according to the Rumb found by these brief Rules, 3126 *m.* I demand the difference of Longitude in the Æquinoctial.

To find the difference of Longitude in the Æquinoctial, Say, *As the Logarithm of the difference of Latitude upon the Globe* 1055 m. 302325 ; *is to the Logarithm of the difference of Longitude*

tude

e in a Right-lined Triangle, 3126 *m.* 9498 ; *so is the Logarithm of the differ-ce of Latitude in Meridional parts*, 17, 315136 ; *to the Logarithm of the ference of Longitude in the Æquinoctial* 98, 362309 : Add the Logarithm the difference of Longitude in a ght-lined Triangle, to the Logarithm the difference of Latitude in Me-ional parts, and Subtract the Lo-rithm of the difference of Latitude on the Globe, and you have the garithm of the difference of Lon-tude in the Æquinoctial, 4198 *m.* 62309, demanded.

The fifth Question to be resolved by *Mercator's* brief Rules; The difference Longitude in the Æquinoctial 200 *m.* and the difference of Latitude it is upon the Globe 1055 *m.* and e difference of Latitude in Meri-ional parts 1417 ; I demand the diffe-ence of Longitude in a Right-lined riangle. To find the difference of ongitude in a Right-lined Triangle, y *Mercators* brief Rules: Say, *As the ogarithm of the difference of Latitude*

in Meridional parts 1417, 31513 *to the Logarithm of the difference of* *gitude in the Æquinoctial* 420 362324; *So is the Logarithm of* *difference of Latitude upon the* 1055 m. 302325; *to the Logarith* *the difference of Longitude in a Ri* *lined Triangle*, 3127, 349513: the Logarithm of the differenc Longitude in the Æquinoctial, to Logarithm of the difference of L tude upon the Globe, and Subtract Logarithm of the difference of L gitude in the Æquinoctial, you have the Logarithm of the di rence of Longitude in a Right-li Triangle, 3127, 349513; demand

In the next place *Mercator* d borrow the Rules of the Globe, find the difference of Meridians any one Parallel.

EXAMPLE.

There are two Meridians differi in Longitude 70 *d.* 00 *m.* in the quinoctial, *Bermudus* Latitude 32

25

513*m.* I demand the difference of
e of idians in the Latitude of 32 *d.*
420*m.*

h of o find the difference of Meridians
he ween 70 *d.* 00 *m.* of Longitude, in
rith Latittude of 32 *d.* 25. *m.* Say, *As*
R *Radius* 90 d. 00 m. 1000000; *is*
: *the Logarithm of* 70 d. 00 m. *or*
nc 00 m. 362324; *So is the Co-sine*
to *he Latitude of Bermudus* 57 d. 35 m.
L 2643; *to the Logarithm of* 354967,
ct 3545*m.* *or* 59 d. 05 m. Add the Lo-
L ithm of the difference of Longi-
de in the Æquinoctial, to the Co-
di e of the Latitude, and Subtract the
li dius, and you have the Logarithm
nd the difference of Meridians, in the
d titude of *Bermudus*, 32 *d.* 25 *m.*
, 4967; or 3545 *m.* or 59 *d.* 05 *m.*
s manded.

Last of all, there are two Meridians
ffering in Longitude 70 *d.* 00 *m.* in
e Æquinoctial; the *Lyzard* Latitude
0 *d.* 00 *m.* I demand the difference
f Longitude in the Latitude of 50 *d.*
To find the difference of Meridians
etween 70 *d.* 00 *m.* of Longitude, in

the Latitude of 50 *d.* 00 *m.* Say, *the Radius* 90 d. 00 m. 1000000 *to the Logarithm of* 70 d. 00 m. 4200 m. 362324 : *So is the Co-sine of the Latitude of the* Lyzard 40 d. 00 980806 ; *to the Logarithm of* 3431 *or* 2700 *m. or* 45 d. 00 *m.* Add Logarithm of the difference of L gitude in the Æquinoctial, to the C sine of the difference of Latitude, a Subtract the Radius, and you ha the Logarithm of the difference Meridians in the Latitude of the L *zard*, 50 *d.* 00 *m.* 343130; or 2700 or 45 *d.* 00 *m.*

I have given you a full account all the brief Rules, by which *Mercat* doth pretend to perform the work Navigation, wherein you may obser there is not one Queſtion in all *Merc tors* brief Rules, that is in proportio to the diſtance between the Meridia and Parallel of the *Lyzard*, and th Meridian and Parallel of *Bermudus* therefore *Mercators* brief Rules are o no further uſe in Navigation, in regard the brief Rules are not in proportion

to

the distance of places; so that the
rk of Navigation cannot be per-
med without those Rules are in
portion to a Geometrical demon-
tion.

Then observe you cannot measure
distance of places, differing in
ngitude and Latitude in *Mercators*
ani-Sphere, in proportion to the
tance of places upon the Globe:
herefore Mr. *Edward Wright* in his
orrection of Errours in Navigation,
page 59. saith, *If two places differ*
so in Longitude as well as in Latitude,
ok how many degrees the difference of
atitude containeth; so many degrees of
e Æquinoctial take with your Compass,
nd leading one foot in the Æquinoctial,
ove forward the other also Parallel-wise,
eeping always that distance, till it cross
he Rumb of those two places, in such sort,
hat one Foot resting in that crossing, the
ther carried about may but touch the
Æquinoctial, then take with your Compass
he Segment or part of the Rumb, between
hat crossing, and the Æquinoctial, set
both Feet in the Æquinoctial, and see

how many degrees are contained be
them, for so many score Leagues
distance of those two places. So
you are to take with your Com
the difference of Latitude from
Æquinoctial, which is of equal p
and run that Parallel to the Æ
noctial, untill the other point
cross the Rumb, then take the dist
from the point that crosses the Ru
to the place where the Rumb
cross the Æquinoctial, and meas
that distance in the Æquinoct
which is of equal parts for the dista
between the *Lyzard* and *Bermud*
Therefore *Mercator* doth grant t
the difference of Latitude, and
distance of Places, must be measu
by a Scale of equal parts, to be in p
portion to the Rumb by the Magnet
Compass; this position agrees w
the Common Chart: Then in t
plainest Rules of Art, the differen
of Latitude and the distance of Plac
being measured by a Scale of equ
parts, the difference of Longitude mu
be of equal parts, in proportion to th
differenc

rence of Latitude, and the distance
places, in a Right-lined Triangle,
erwise you must alter the Rumb
the Magnetick Compass, and the
ance of places.

But *Mercator* opposeth this position
his Plani-Sphere, and from the
thmetical Rules of the Globe,
erein the difference of Meridians
ween the Meridian and Parallel of
rmudus, and the Meridian of the
zard is 59 *d.* 05 *m.* likewise *Mer-*
or proves the difference of Meridians
his Plani-Sphere, between the Me-
dian and Parallel of *Bermudus*, and
e Meridian of the *Lyzard*, to be in
roportion to the difference of Meri-
ians upon the Globe, by taking half
degree above the Latitude of *Bermu-*
us, 32 *d.* 25 *m.* and half a degree
elow the Latitude of 32 *d.* 25 *m.*
which distance is a degree of Longi-
ude in the Latitude of *Bermudus*,
therefore so oft as you can have that
distance between the Meridian of *Ber-*
mudus, and the Meridian of the *Lyzard*,
such is the difference of Longitude

59 *d.* 05 *m.* Do the like, and you shall have the difference of Meridians between places in any other Parallel upon *Mercators* Plani-Sphere, in proportion to the difference of Meridians between places in any Parallel of the Globe, so that the difference of Longitude between the Meridian and parallel of *Bermudus*, and the Meridian of the *Lyzard*, is greater than the distance, which is out of all proportion in a Right-lined Triangle. Therefore *Mercator* hath no Geometrical Demonstration, either in oblique Angles or by Right-lined Angles, to prove the difference of Meridians, as it is upon the Globe, to be in proportion to the difference of Latitude, and the distance of places, and the Rumb by the Magnetick Compass.

I have proved how the difference of Latitude, and the difference of Longitude, and the distance of places in the Common Chart, is transferred to be in proportion upon the Globe.

I have proved how the difference of Longitude in all Right-lined Triangles,

is

is in proportion to the middle Parallel of all places upon the Globe, therefore the Meridians of the Globe, as they are drawn, muſt differ from the Meridians of the Magnetick Compaſs; ſo that it is the principal point in Navigation, to enquire whether the North and South Points of the Magnetick Compaſs, run in the Meridians of the Globe, as they are drawn, or whether the North and South points of the Magnetick Compaſs, run parallel to the Poles of Eaſt and Weſt, as the Eaſt and Weſt points of the Magnetick Compaſs, run parallel to the Poles of North and South: Therefore I ſhall proceed to lay a Foundation in Navigation, that men may no longer halt between three opinions, wherein I ſhall prove by obſervation and demonſtration from the Magnetick Compaſs, as it is Horizontal, that the North and South Points of the Magnetick Compaſs, run Parallel to the Poles of Eaſt and Weſt, as the Eaſt and Weſt points of the Magnetick Compaſs run Parallel to the Poles of North

and

and South; ſo that the Common Chart that is ſo much rejected, is the only Truth in Navigation.

In the firſt place, I ſhall prove the Eaſt and Weſt Points of the Magnetick Compaſs, point to the Poles of Eaſt and Weſt in the Celeſtial Sphere, in all Meridians and Parallels of the Terreſtial Sphere; then I ſhall prove the Eaſt and Weſt Points of the Magnetick Compaſs run Parallel to the Poles of North and South, in all Meridians and Parallels of the Terreſtial Sphere.

EXAMPLE.

By Obſervation, if the Sun be upon the Horizon in the Æquinoctial, the Suns Amplitude ſhall be Eaſt or Weſt of you, by the Magnetick Compaſs, as it is Horizontal, in all Meridians and Parallels of the Terreſtial Sphere; but if I was in the Latitude of 32 *d.* 25 *m.* or in any other Latitude, and I was to Sail by the Magnetick Compaſs Eaſt or Weſt, the Circulation of

the

the Earth and Sea, I ſhall find I have not altered my Latitude by obſervation; therefore the Eaſt and Weſt courſe of the Magnetick Compaſs agrees with the Parallels of Latitude upon the Terreſtial Sphere by obſervation; this poſition cannot be proved, but from the Latitude of Places by obſervation, which agrees with the Eaſt and Weſt courſe of the Magnetick Compaſs; ſo that the Parallels of Latitude upon the Globe, are of equal diſtance from the Poles of North and South, and in proportion to the Rumb by the Magnetick Compaſs.

In the next place, I ſhall prove the North and South Points of the Magnetick Compaſs, point to the Poles of North and South in the Celeſtial Sphere, in all Meridians and Parallels of the Terreſtial Sphere. Then I ſhall prove the North and South Points of the Magnetick Compaſs, muſt run parallel to the Poles of Eaſt and Weſt, in all Meridians and Parallels of the Terreſtial Sphere.

Example.

EXAMPLE.

By *Observation*, If the Sun or Star be upon their Meridian in any Meridian and Parallel of the Terrestial Sphere, the Sun's or Stars Azimuth must be North or South, by the Horizontal bearing of the Magnetick Compass to the Celestial Poles; so that the Magnetick Compass, as it is Horizontal, points to the Celestial Poles of North and South, and to the Celestial Poles of East and West, in all Meridians and Parallels of the Earth and Sea; without giving any difference of observation for the Semi-Diameter of the Earth and Sea, and notwithstanding the Magnetick Compass points to the Celestial Poles of North and South, and to the Celestial Poles of East and West, in all Meridians and Parallels of the Terrestial Sphere, it is proved by observation, that you may run the Circulation of the Earth by the Magnetick Compass, in any Parallel of Latitude; therefore the Magnetick Compass

Compaſs muſt run Parallel to the Poles of Eaſt and Weſt, as the Magnetick Compaſs runs Parallel to the Poles of North and South in the Terreſtial Sphere, in regard the Magnetick Compaſs makes the ſame poſition to the Poles of Eaſt and Weſt, and to the Poles of North and South, in the Celeſtial Sphere; ſo that the difference of Meridians by the Magnetick Compaſs, as it is Horrizontal upon the Terreſtial Sphere, is of equal diſtance from the Poles of Eaſt and Weſt, as the difference of the Parallels of Latitude by the Magnetick Compaſs, as it is Horizontal, is of equal diſtance from the Poles of North and South.

This poſition muſt be infallible; for by obſervation, the Magnetick Compaſs, as it is Horizontal, points to the Celeſtial Poles; ſo that the North and South points of the Magnetick Compaſs, do croſs the Eaſt and Weſt points of the Magnetick Compaſs, at Right-Angles, in all Meridians and Parallels of the Earth and Sea: Therefore the Magnetick Compaſs, doth meaſure

measure the superficies of the Globe by Right-lines, as if the superficies of the Globe was a Plain to the Horizon.

In the next place, if the Sun be in the Æquinoctial, and that you were in the Latitude of 60 *d.* or 70 *d.* or 80 *d.* of North or South Latitude, the Sun upon the Horizon shall be East of you in the Morning, and West of you in the Afternoon, by the Magnetick Compass, in its true Poles, as if you were in the Æquinoctial part of the Earth or Sea: The reason of this observation is this, the Terrestial Sphere is spacious to us that are upon it, but it appears to be no other than a Center to the body of the Sun or Stars, in regard the Magnetick Compass runs atwhart the Parallels of Latitude in the Terrestial Sphere, to the Poles of East and West in the Celestial Sphere, without giving any difference of observation for the Semi-Diameter of the Earth and Sea: Therefore it had been impossible to find the Magnetick Compass, should run Parallel to the Poles of North and South in the Terrestial

eſtial Sphere, if the Meridian Alti-
ude of the Sun or Stars, by obſer-
vation, did not produce the ſame La-
itude or Parallel with the Magnetick
Compaſs, the Circulation of the
Earth, in regard the Magnetick Com-
paſs, as it is Horizontal, points to the
Poles of East and West in the Ce-
leſtial Sphere, as the Magnetick Com-
paſs points to the Poles of North
and South in the Celeſtial Sphere.

Then obſerve, there is no reaſon in
Navigation to ſuppoſe the Meridian,
or the North and South Points of the
Magnetick Compaſs, as it is Hori-
zontal, to the Meridian Altitude of
the Sun or Stars, in the Celeſtial
Sphere, to run to the North and
South Poles, as it is in the Terreſtial
Sphere; but that you may likewiſe
ſuppoſe Meridians, or the East and
West points of the Magnetick Compaſs,
as it is Horizontal, to the Suns Ampli-
tude in the Æquinoctial, to run to the
Poles of East and West in the Ter-
reſtial Sphere; in regard the Mag-
netick Compaſs makes the ſame
poſition,

position, to the Poles of East and West, as it has to the Poles of North and South in the Celestial Sphere.

In the next place it must be granted if the East and West points of the Magnetick Compass, in the Parallel of 80 *d.* point to the Poles of East and West in the Celestial Sphere; without giving any difference of observation, for almost the Semi-Diameter of the Earth, in the Terrestial Sphere, then the North and South Points of the Magnetick Compass, in the Meridian of 80 *d.* must point to the Poles of North and South in the Celestial Sphere, without giving any difference of observation, for almost the Semi-Diameter of the Earth, in the Terrestial Sphere: Therefore the Meridians of the Magnetick Compass, hath the same position in the Terrestial Sphere, and must run Parallel to the Poles of East and West, as the Parallels of Latitude run Parallel by the Magnetick Compass, to the Poles of North and South.

Then

Then obſerve the Magnetick Compaſs, being always Horizontal to the Horizon, it doth meaſure the Superficies of the Earth and Sea by Right-lines, in the Parallel Meridians to the Poles of Eaſt and Weſt, and in the Parallels to the Poles of North and South, as if the Superficies of the Globe was a plain to the Horizon; this poſition you have at large in the Common Chart, wherein you have the difference of Meridians, and the difference of Latitude, and the diſtance of places in proportion to the Rumb, and the Right-lines of the Magnetick Compaſs.

If the poſition of the Common Chart be not the only truth in Navigation, there is no Geometrical Demonſtration in proportion to the Rumb, and the Right-lines of the Magnetick Compaſs.

Therefore it hath been a great miſtake in all Writers, to ſuppoſe the Magnetick Compaſs to agree with the Meridians of the Globe as they are drawn; whereas, there is no obſer-

vation or demonſtration to prove it only the Meridians of the Magnetic Compaſs, as it is Horizontal to th Meridians of the Sun and Stars, poin to the Poles of the Celeſtial Sphere To this I muſt reply, that the Ea and Weſt points of the Magnetic Compaſs, as it is Horizontal, poin to the Eaſt and Weſt Poles of the Ce leſtial Sphere, from all Meridians an Parallels of the Terreſtial Sphere; ſo that you may as well draw Meridian in Navigation by the Magnetick Com paſs, from the Poles of Eaſt and Weſt as from the Poles of North and South in the Terreſtial Sphere; therefore the work of Navigation cannot be per-formed by the oblique Lines of the Globe.

I have proved by obſervation, that the Eaſt and Weſt points of the Mag-netick Compaſs, run Parallel to the Poles of North and South in the Terreſtial Sphere, therefore the North and South points of the Magnetick Compaſs, muſt run Parallel to the Poles of Eaſt and Weſt in the Ter-reſtial

reſtial Sphere; in regard thoſe Poles do croſs at Right-Angles, in all Meridians and Parallels of the Earth and Sea.

Laſt of all, I ſhall ſhew you the errours that attend *Mercator*.

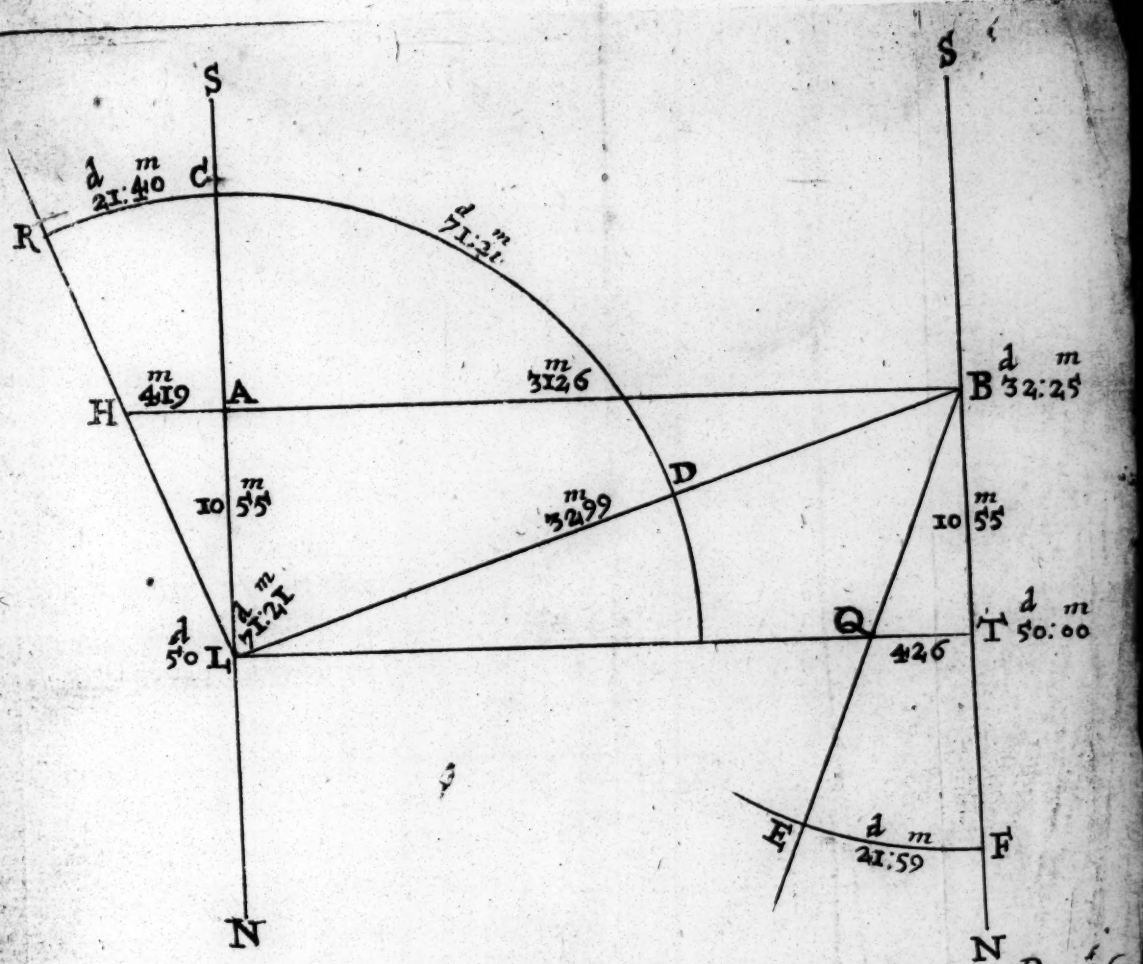
I have proved that *Mercator* does grant the difference of Latitude, and the diſtance of places to be of equal parts, and to be in proportion to the Rumb by the Magnetick Compaſs in a Right-lined Triangle; ſo that *Mercator* hath granted three parts in four in a Right-lined Triangle; then if the difference of Longitude in a Right-lined Triangle, be not the true difference of Meridians, according to the Rumb by the Magnetick Compaſs, we have no Geometrical Demonſtration in Navigation, therefore I ſhall proceed to find the diſtance between the Meridian and Parallel of *Bermudus*, and the Meridian and Parallel of the *Lyzard*, in a Right-lined Triangle, from the Rumb found by the brief Rules of *Mercator*, and the difference of Latitude.

And last of all, I shall shew you the disproportion between the Meridians of the Common Chart, and the Meridians of *Mercator* and the Globe, as they are drawn; so that whoever pretends to keep account of the Ships way, according to the difference of Meridians in *Mercator*'s Plani-Sphere, or according to the difference of Meridians upon the Globe, they must commit gross errours.

EXAMPLE.

I Sail from the Meridian and Parallel of the *Lyzard*, in the Latitude of 50 *d.* 00 *m.* in an Angle of 71 *d.* 21 *m.* South-Westward: As the Rumb is found by the brief Rules of *Mercator*, into the Meridian and Parallel of *Bermudus*, in the Latitude of 32 *d.* 25 *m.* I demand the distance and the difference of Longitude between the Meridian and Parallel of *Bermudus*, and the Meridian and Parallel of the *Lyzard*, in a Right-lined Triangle.

The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The Angles of position by *Mercators* brief Rules, do differ from the Angles of position by the Common Chart 11 *m.* however the distance between the *Lyzard* and *Bermudus* cannot be known, but by a Right-lined Triangle.

The Angle following being a Right-lined Triangle, is in like proportion to the Common Chart, so is L the Meridian and Parallel of the *Lyzard*, and B is the Meridian and Parallel of *Bermudus*: Then is L A the difference of Latitude 1055 *m.* and C L D is the Rumb or Angle of position, between the Meridian and Parallel of the *Lyzard*, and the Meridian and Parallel of *Bermudus*, then is A B and L T the difference of Longitude between the Meridian of the *Lyzard*, and the Meridian of *Bermudus*, and L B is the distance between the *Lyzard* and *Bermudus*, then is B H and L Q the difference of Longitude in *Mercators* Plani-Sphere, and upon the Globe, which differs from the Meridians of the Common Chart 419 *m.* and 426 Miles.

To find the distance between the Meridian and Parallel of the *Lyzard* and *Bermudus*, L B, the proportions Arithmetical: *As the Co-sine of the Rumb* 71 d. 21 m. A B L, 950485; *is to the Logarithm of the difference of Latitude* 1055 m. L A, 302325: *So is the Radius* 90 d. L A B, 1000000; *to the Logarithm of the distance* 3299 m. L B; 351840 *demanded*: Add the Logarithm of the difference of Latitude to the Radius, and Subtract the Co-sine of the Rumb, and you have the Logarithm of the distance 351840, L B, 3299 *m.*

Thus you see when *Mercator* hath wearied himself with finding brief Rules, to be in proportion between the difference of Longitude in the Æquinoctial, and the difference of Latitude in Meridional parts, to find the Rumb by the Magnetick Compass: Then *Mercator* doth grant that the distance of places differing in Longitude and Latitude, cannot be found by any Geometrical Demonstration, to be in proportion to the Rumb by the Magnetick

netick Compaſs, and the difference of Latitude, but by a Right-lined Triangle; therefore *Mercator* doth grant three parts in four in a Right-lined Triangle; then if the difference of Longitude in a Right-lined Triangle, be not the true difference of Meridians, there is no Geometrical Demonſtration in Navigation, to find the difference of Meridians in proportion to the Rumb by the Magnetick Compaſs.

In the next place I ſhall proceed to find the difference of Longitude in a Right-lined Triangle, from the difference of Latitude, and the Rumb found by *Mercators* brief Rules.

EXAMPLE.

I Sail from the Meridian and Parallel of the *Lyzard*, in the Latitude of 50 *d.* 00 *m.* in an Angle of 71 *d.* 21 *m.* South-Weſtward: As the Rumb is found by the brief Rules of *Mercator*, into the Meridian and Parallel of *Bermudus*, in the Latitude of 32 *d.*

25 *m.* I demand the difference of Longitude in a Right-lined Triangle.

To find the difference of Longitude the proportions Arithmetical: *As the Radius* 90 d. A B L, 1000000; *is to the Logarithm of the difference of Latitude* 1055 m. L A, 302325: *So is the Tangent of the Rumb* 71 d. 21 m. A L B, 1047171; *to the Logarithm of the difference of Longitude* 349496, A B, 3126 *m.* Add the Logarithm of the difference of Latitude to the Tangent of the Rumb, and Subtract the Radius, and you have the Logarithm of the difference of Longitude, in proportion to the Rumb by the Magnetick Compass, and the difference of Latitude in a Right-lined Triangle.

In the practical part of the Sea, the Rumb is always given, as in the first Question in the Common Chart, 71 *d.* 10 *m.* So that the brief Rules of *Mercator* do alter the Rumb 11 *m.* which alters the difference of Longitude 33 *m.* and the distance 30 *m.* otherwise this latter Right-lined Triangle would agree

agree with the former. I ſhall paſs by theſe ſmall errours, and proceed to the greater in *Mercators* Plani-Sphere, and upon the Globe, the difference of Longitude between the Meridian and Parallel of *Bermudus*, and the Meridian of the *Lyzard*, is proved to be 3545 *m.* B H, or 59 *d.* 05 *m.* and the difference of Longitude is proved to be 3126 *m.* B A, according to the Common Chart; ſo that the difference of Longitude in *Mercator*'s Plani-Sphere, and upon the Globe, is more than the difference of Longitude in the Common Chart, by 419 *m.* A H; therefore, if I was to Sail from B to H, I muſt out-run the Meridian of the *Lyzard* in the Common Chart 419 *m.* before I can expect to arrive in the Meridian of *Mercator*, or the Meridian of the Globe: Then if I was to Sail from L to H by the Magnetick Compaſs, I muſt Sail in an Angle of 21 *d.* 40 *m.* South-Eaſtward by the Magnetick Compaſs, to arrive in the Meridian of the Globe or *Mercator*; ſo that I have ſhewed you how great

great the disproportion is between the Meridians of the Common Chart, and the Meridians of *Mercator*, or the Meridians of the Globe; therefore the Meridians of the Magnetick Compass were never rightly understood.

Likewise in *Mercators* Plani-Sphere, and upon the Globe, the difference of Longitude between the Meridian and Parallel of the *Lyzard*, and the Meridian of *Bermudus*, is proved to be 2700 *m.* L Q, or 45 *d.* and the difference of Longitude is proved to be 3126, L T, according to the Common Chart; so that the difference of Longitude is *Mercator*'s Plani-Sphere, and upon the Globe is less than the difference of Longitude in the Common Chart, by 426 *m.* Q T; so that if I was to Sail from L to T, I must run 426 *m.* before I can arrive in the Meridian of *Bermudus*, in the Common Chart: Then if I was to Sail from B to Q, by the Magnetick Compass, I must Sail in an Angle of 21 *d.* 59 *m.* North-Eastward, before I can arrive in the Meridian of the Globe

or

or *Mercator*; ſo that I have ſhewed you how great the diſproportion is between the Meridians of the Common Chart, and the Meridians of *Mercator*, or the Meridians of the Globe; therefore the Meridians of the Magnetick Compaſs were never rightly underſtood, in regard there are ſuch various opinions in Navigation, and the diſproportion between one poſition and the other is ſo great, inſomuch that the Queſtion may be asked, what is truth in Navigation?

I have proved by Demonſtration and Obſervation, that the Magnetick Compaſs, as it is Horizontal, doth point to the Poles of Eaſt and Weſt in the Celeſtial Sphere, in all Meridians and Parallels of the Earth and Sea, without giving any difference of obſervation for the Semi-Diameter of the Earth: But by obſervation from the Meridian Altitude of the Sun and Stars, the Magnetick Compaſs doth run Parallel to the Poles of North and South in the Terreſtial Sphere, the Circulation of the Earth; therefore it had

had been impoſſible to prove the Magnetick Compaſs ſhould run Parallel to the Poles of North and South, in the Terreſtial Sphere; if the Magnetick Compaſs did not run Parallel to the Latitude of places by obſervation.

Likewiſe, I have proved by Obſervation and Demonſtration, that the Magnetick Compaſs, as it is Horizontal, doth point to the Poles of North and South in the Terreſtial Sphere, in all Meridians and Parallels of the Earth and Sea, which Meridians do croſs the Eaſt and Weſt Poles of the Magnetick Compaſs, as it is Horizontal to the Celeſtial Sphere, at Right-Angles, in all Meridians and Parallels in the World: Therefore the Meridians of the Magnetick Compaſs being Horizontal, muſt run Parallel to the Poles of Eaſt and Weſt in the Terreſtial Sphere, as the Magnetick Compaſs, being Horizontal, doth run Parallel to the Poles of North and South in the Terreſtial Sphere.

Laſt

Laſt of all, the Magnetick Compaſs being of Right-lines, doth meaſure the Superficies of the Globe by Right-lines, as if the ſuperficies of the Globe was always a plain to the Horizon: ſo that whatever projection diſagrees with the Rumb, and the difference of Latitude, and the difference of Longitude, and the diſtance of places, as it is in proportion in a Right-lined Triangle, muſt be a falſe poſition in Navigation: therefore there is but one truth in Navigation, and that is the Common Chart, that hath been ſo much rejected by all Writers, for the Meridians and Parallels of places cannot be known upon the Globe or *Mercators* projection, but as it is transferred from the Common Chart, which is in proportion to a Right-lined Triangle.

I ſhall proceed to the Arch of a great Circle, which is the third poſition, or principal kind of Sailing ſo called, wherein I ſhall ſhew you, that the Queſtion cannot be given from the practical part of the Sea, but muſt alter

alter the Meridian and Parallel of all places upon the Globe.

SAILING by the Arch of a great Circle.

The true distance between two places in the Arch of a great Circle, as in the following Rules.

1. IF both places have no Latitude, as being under the Æquinoctial, and one of them no Longitude, then the Longitude of the other place is the distance: If it be not above 180 *d.* but if it be above 180 *d.* then Subtract it out of 360 *d.* the remainder is the distance.

2. If both places have Longitude under the Æquinoctial, the difference of Longitude is the distance, so it be under 180 *d.* but if it be above 180 *d.* then Subtract it out of 360 *d.* and the remainder is the difference of Longitude.

3. If

3. If both places have one and the ſame Meridian, and one of them have Latitude, then the Latitude is the diſtance.

4. If both places have Latitude, as both Northerly or both Southerly, being under the ſame Meridian, the difference is the diſtance.

5. If one place have North Latitude, and the other South Latitude, being under the ſame Meridian, the ſum of both is the diſtance.

The Arch of a great Circle in the Terreſtial Globe, doth give a nearer diſtance of places than the Common Chart; ſo that the Arch of a great Circle does not run in the Parallels of the Globe, without it be in the Æquinoctial: Likewiſe the Angles of poſition in the Arch of a great Circle, do differ from the Angles of poſition by the Magnetick Compaſs; inſomuch that the Queſtion cannot be given from the Rumb by the Magnetick Compaſs, in the practical part of the Sea, but you muſt alter the Meridian and Parallel of all places in the Globe.

Example.

EXAMPLE.

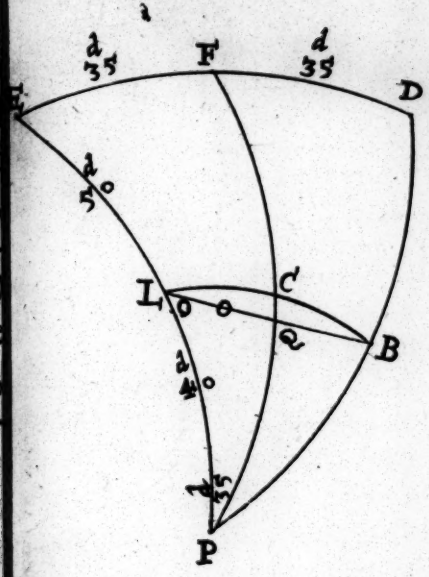
There are two places in the Parallel of 50 *d.* that differ in Longitude 70 *d.* in the Æquinoctial, I demand the Angle of position, and the distance.

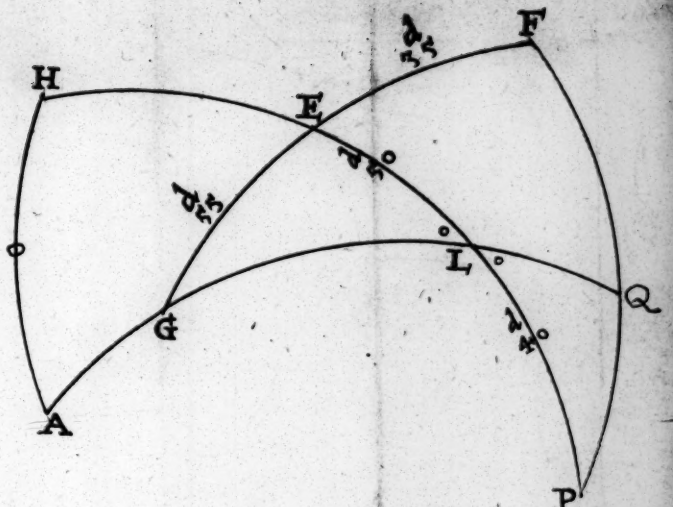
The Demonstration follows, E F D the Æquinoctial, L C B the Parallel of Latitude 50 *d.* L Q B the nearest distance, L Q half the nearest distance, E L the Latitude 50 *d.* L P the Complement of the Latitude 40 *d.* E P D the Angle at the Pole, or the difference of Longitude in the Æquinoctial, 70 *d.* E P F the Angle of half the difference of Longitude 35 *d.*

To find the distance.

As the Radius 90 d. P E, 1000000;
is to the Sine of 35 d. E F, 975859;
So is the Sine of 40 d. P L, 980806;
to the Sine of 21 d. 38 m. L Q, 956665.
Add the Sine of 35 *d.* E F, to the Sine of 40 *d.* P L; and Subtract the Radius

90 *d.*





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99 *d.* PE, and you have the Sine of half the diſtance 956665, L Q, 21 *d.* 38 *m.* the double of L Q, 21 *d.* 38 *m.* is 43 *d* 16 *m.* L Q B, or 2596 M. the diſtance or the difference of Longitude, in the Latitude of 50 *d.* demanded.

From hence you may obſerve that the Arch of a great Circle doth not run in the Parallel of Latitude by Obſervation, L C B, but doth run in an Arch of a nearer diſtance, as L Q B, for it is proved the difference of Longitude upon the Globe, in the Parallel of 50 *d.* L C B, is 45 *d.* or 2700 M. and by the Arch of a great Circle, the diſtance L Q B, is 43 *d.* 16 *m.* or 2596 *m.* So that the Arch of a great Circle doth differ from the diſtance of places in the Parallels of the Globe, 1 *d.* 44 *m.* or 104 Miles, which muſt alter the Latitude by obſervation, and the Rumb by the Magnetick Compaſs.

In the next place I ſhall find the Angle of poſition by the Arch of a great Circle, the Queſtion requires

another demonſtration, before I can reſolve the Queſtion as in the adjacent figure.

To find the Angle of poſition.

As the Sine of 50 d. L E, 988425; *is to the Tangent of* 55 d. E G, 1015477: *So is the Radius* 90 d. L H, 1000000; *to the Tangent of* 1027052, H L A, 61 d. 48 m. *and is equal to the Angle* B L P, 61 *d.* 48 m. *which is the Angle of poſition, to the Arch of a great Circle* L Q B. Add the Tangent 55 *d.* E G, to the Radius 90 *d.* L H, and Subtract the Sine of 50 *d.* L E, and you have the Tangent of the Angle H L A, 1027052, 61 *d.* 48 *m.* demanded.

Then Obſerve, if you Sail in an Angle of 61 *d.* 48 *m.* North-Weſtward, by the Magnetick Compaſs, from L, you cannot arrive at Q or B, in regard you cannot Sail from one place to another in the ſame Parallel, without you Sail Eaſt or Weſt by the Magnetick Compaſs; ſo that the Arch of a great Circle runs in a nearer diſtance

diſtance than the Parallel of Latitude: Therefore you cannot Sail by the Magnetick Compaſs from the Latitude of 50 *d.* L, into the Latitude of 50 *d.* B, in an Angle of 61 *d.* 48 *m.* in the Arch of a great Circle L Q B.

But it may be Objected, that I may alter my Courſe to arrive at B. If ſo, then I muſt alter the Queſtion. Therefore ſuppoſe the Queſtion to be this, I have Sailed from the Latitude of 50 *d.* L, in angle of 61 *d.* 48 *m.* North-Weſtward, 400 *m.* I demand in what Meridian and Parallel of the Globe I am in. I have proved I cannot Sail in an Angle of 61 *d.* 48 *m.* from the Latitude of 50 *d.* L, by the Magnetick Compaſs, and in the Arch of a great Circle L Q B, ſo as to arrive in the Latitude of 50 *d.* at B; then is it impoſſible for me to know in what Meridian and Parallel of the Globe I am, in regard the Magnetick Compaſs does not run in the Arch of a great Circle: Therefore I muſt reſolve the Queſtion by a Right-lined Triangle, and transferr the Meridian and Parallel of places found in a

Right-lined Triangle, into the Meridian and Parallel of the Globe; ſo that you cannot perform the work of Navigation by the Oblique Lines of the Globe, in the Arch of a great Circle: In regard the Oblique Lines of the Globe differ from the Rumb, and the Right-Lines of the Magnetick Compaſs, inſomuch that you cannot give the Queſtion from the practical part of the Sea, to be in proportion to the Angles of poſition, and the diſtance of places in the Arch of a great Circle, but you muſt alter the Meridian and Parallel of places in the Globe.

I ſhall add one Example more from the foregoing Queſtion, between the Lyzard *and* Bermudus.

The *Lyzard* in the Latitude of 50 *d.* E L, *Bermudus* in the Latitude of 32 *d.* 25 *m.* F B; their difference of Longitude in the Æquinoctial 70 *d.* E P F. I demand the Angles of poſition E L B, and L B P, and their diſtance L B, in an Arch of a great Circle.

The demonſtration follows, E F the Æquinoctial, C B the Parallel of the

the Latitude of *Bermudus*, L A the Parallel of the Latitude of the *Lyzard*, E P F the Angle at the Pole, or the difference of Longitude in the Æquinoctial 70 *d.* L P the Complement of the Latitude of the *Lyzard* 40 *d.* B P the Complement of the Latitude of *Bermudus*, 37 *d.* 35 *m.* L B the distance between the Meridian and Parallel of the *Lyzard*, and the Meridian and Parallel of *Bermudus*, then is the Angle E L B, the Angle of position between the *Lyzard* and *Bermudus*, and the Angle L B P, is the Angle of position between *Bermudus* and the *Lyzard.*

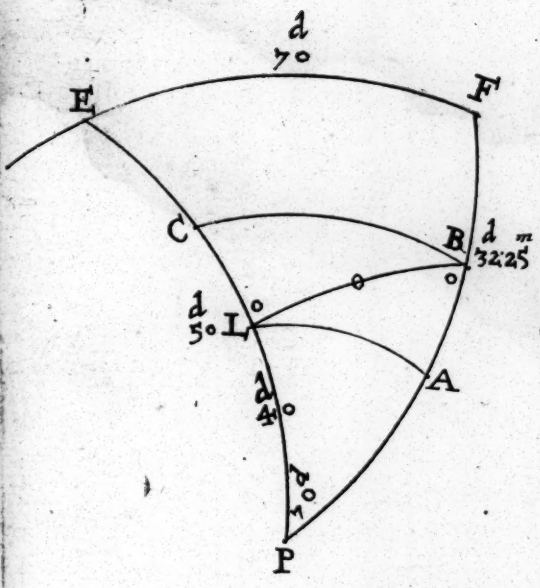
This Question requires a further Demonstration, before we can find Arithmetical proportion, as in the adjacent figure, and in the first place we are to find the side P A; then say, *As the Sine of* 20 d. G E, 953405; *is to the Tangent of* 50 d. E L, 1007618: *So is the Radius* 90 d. G F. 1000000; *to the Tangent of* 1054213, F A, 73 d. 59 m. *whose Complement is* 16 d. 01 m. A P: *Then Subtract* A P, 16 d. 01 *m. out of* P B, 57 d. 35 m. *and you have*

41 d. 34 m. A B. Add the Tangent of 50 *d.* E L, to the Radius 90 *d.* G F, and Subtract the Sine of the 20 *d.* G E, and you have the Tangent of 73 *d.* 59 *m.* F A, whoſe Complement is A P, 16 *d.* 01 *m.* demanded.

Now to find the diſtance you have the ſide A P, 16 *d.* 01 *m.* and the ſide L P, 40 *d.* and the ſide A B, 41 *d.* 34 *m.* I demand the diſtance L B.

As the Co-ſine of 16 d. 01 m. A P, 998280; *is to the Co-ſine of* 40 d. L P, 988425: *So is the Co-ſine of* 41 d. 34 m. A B, 987400; *to the Co-ſine of* 977545, L B, 53 d. 24 *m.* the diſtance between the Meridian and Parallel of the *Lyzard*, and the Meridian and Parallel of *Bermudus* by the Arch of a great Circle, but by the Common Chart the diſtance is 3268 *m.* or 54 *d.* 28 *m.* which is 64 *m.* or 01 *d.* 04 *m.* more than the diſtance by the Arch of a great Circle.

Now to find the Angle of poſition from the *Lyzard* to *Bermudus* C L B, the ſide L B is 53 *d.* 24 *m.* the Angle L P B is 70 *d.* the ſide P B is 57 *d.* 35 *m.*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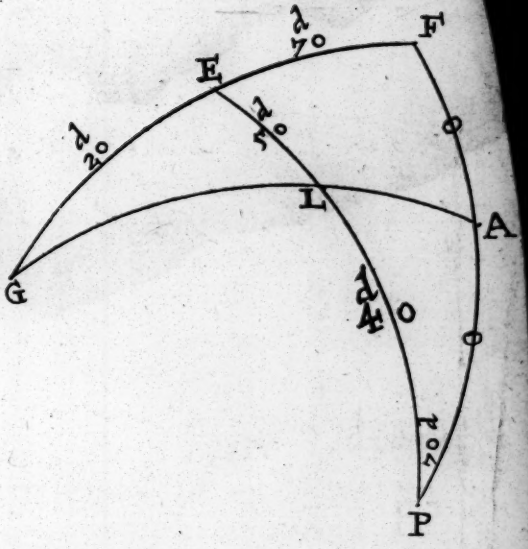
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I demand the Angle of poſition from the *Lyzard* to *Bermudus* C L B.

As the Sine of the ſide L B, 53 *d.* 24 *m.* 990461 ; *is to the Sine of the Angle* L P B, 70 d. 00 m. 997298 : *So is the Sine of the ſide* P B, 57 *d.* 35 *m.* 992643 ; *to the Sine of the Angle of poſition between the* Lyzard *and* Bermudus 999480, C L B, 81 d. 10 m. *South-Weſtwards.* So that the Angle of poſition in the Arch of a great Circle, doth differ from the Angle of poſition by the Magnetick Compaſs in the Common Chart 10 *d.* 00 *m.* Then if I ſhould Sail in the Angle of 80 *d.* 10 *m.* by the Magnetick Compaſs, from the *Lyzard* L, towards *Bermudus* B, I cannot arrive at *Bermudus*, in regard the Angle of poſition by the Arch of a great Circle, doth differ from the Angle of poſition by the Magnetick Compaſs 10 *d.* 00 *m.*

Laſt of all, I ſhall find the Angle of poſition from *Bermudus* to the *Lyzard*, P B L, the ſide P B is 57 *d* 35 *m.* the Angle C L B is 81 *d.* 10 *m.* the ſide P L is 40 *d.* 00 *m.* I demand the Angle

of position from *Bermudus* to the *Lyzard* P B L.

As the sine of the side P B, 57 d. 35 m. 992643; *is to the Sine of the Angle* C L B, 81 d. 10 m. 999481: *So is the Sine of the side* L P, 40 *d.* 980806; *to the Sine of the Angle of position from* Bermudus *to the* Lyzard 987644, P B L, 48 d. 48 m. *North-Eastwards.* Add the Sine of the Angle C L B, 81 *d.* 10 *m.* to the Sine of the side L P, 40 *d.* and Subtract the Sine of the side P B, 57 *d.* 35 *m.* and you have the Sine of the Angle of position from *Bermudus* to the *Lyzard*, in the Arch of a great Circle 987644, P B L, 48 *d.* 48 *m.* North-Eastwards; so that the Angle of position in the Arch of a great Circle, differs from the opposite Angle of position by the Magnetick Compass, in the same Question 39 *d.* 58 *m.* for the Angle of position from the *Lyzard* to *Bermudus* is 81 *d.* 10 *m.* South-Westward, and the Angles of position from *Bermudus* to the *Lyzard* is 48 *d.* 48 *m.* North-Eastward; then by the Common Rules in Navigation, if I Sail

Sail by the Magnetick Compaſs from the *Lyzard* to *Bermudus*, in an Angle of 81 *d.* 10*m.* South-Weſtward, 3204 M. and was to return to the *Lyzard*, I muſt Sail in an Angle of 08 *d.* 50 *m.* Eaſt-Northwards by the Magnetick Compaſs, in regard 08 *d.* 50 *m.* is the oppoſite point to 81 *d.* 10 *m.* Likewiſe if I Sail by the Magnetick Compaſs from *Bermudus* to the *Lyzard*, in an Angle of 48 *d.* 48*m.* North-Eaſtward 3204 M. and was to return to *Bermudus*, I muſt Sail in an Angle of 41 *d.* 12 *m.* Weſt-Southward.

Then Obſerve, ſuch is the diſproportion in the Angles of poſition in the Arch of a great Circle, that it is impoſſible to Sail by the Magnetick Compaſs in the Arch of a great Circle, and in the Angles of poſition found in the Arch of a great Circle, into the ſame Meridian and Parallel of places upon the Globe, in regard the Angles of poſition in the Arch of a great Circle, does differ from the Angles of poſition by the Magnetick Compaſs.

But it may be Objected, that I may alter

alter my Courſe to arrive at my Port. If ſo, you muſt alter the Queſtion, for by the Angles of poſition in the Arch of a great Circle, you cannot tell where you are upon the Globe; in regard the Angles of poſition in the Arch of a great Circle, does differ from the Angles of poſition by the Magnetick Compaſs, for the Angle of poſition in the Arch of a great Circle, is 81 *d.* 10 *m.* South-Weſtward from the *Lyzard* to *Bermudus*, and it is 48 *d.* 48 *m.* North-Eaſtward from *Bermudus* to the *Lyzard*; and by the Magnetick Compaſs I muſt Sail in an Angle of 71 *d.* 10 *m.* South-Weſtward from the *Lyzard* to *Bermudus*, and I muſt Sail in an Angle of 18 *d.* 50 *m.* Eaſt-Northward from *Bermudus* to the *Lyzard*; ſo the oppoſite point of the Magnetick Compaſs, muſt be the Angle of poſition to return to the ſame Port, or the Magnetick Compaſs is of no uſe in Navigation; ſo that I cannot give the Queſtion from the Practical part of the Sea, to be reſolved by the Arch of a great Circle, but I muſt alter the

the Meridian and Parallel of places in the Globe, therefore you muſt reſolve the Queſtion from the Angle of poſition by the Magnetick Compaſs, and the difference of Latitude in the practical part of the Sea, by a Right-lined Triangle, and tránsferr the Meridian and Parallel of places found in a Right-lined Triangle, into the Meridian and Parallel of the Globe, as I have already ſhewed; ſo that the work of Navigation muſt be reſolved by the Rumb, and the Right-lines of the Magnetick Compaſs in a Right-lined Triangle, before the Meridian and Parallel of places can be known upon the Globe.

Notwithſtanding the Arch of a great Circle will not anſwer the deſign of Navigation by the Magnetick Compaſs; it muſt be granted, that the Arch of a great Circle in the Terreſtial Sphere, and in the Celeſtial Sphere is a true poſition, in regard the Angles of poſition in all Oblique Angles, are in proportion to the ſeveral ſides of all Oblique Angles, which is

is the neareſt diſtance of places.

EXAMPLE.

If I obſerve the diſtance of two Stars, in one and the ſame Parallel, I do meaſure the neareſt diſtance between thoſe two Stars, but I cannot meaſure the extream Arch of that Parallel by obſervation; ſo that the neareſt diſtance is the Arch of a great Circle, by obſervation and demonſtration: Likewiſe all obſervations in the Arch of a great Circle gives the neareſt diſtance; ſo that the Arch of a great Circle does not run in the Parallels of the Globe, without it be in the Æquinoctial, to the Poles of North and South, and in the Ecliptick, which is as the Æquinoctial to the Poles Ecliptick, and upon the Horizon, which is as the Æquinoctial to the Zenith; therefore the Angles of poſition found in the Arch of a great Circle, in any Parallel of Latitude, is not to be meaſured by any Geometrical meaſure upon the Terreſtial or Celeſtial Sphere, without it be at the North or South Poles

Poles the measure of those Angles are in the Æquinoctial, or at the Poles Ecliptick the measure of those Angles are in the Ecliptick Line, or at the Poles of your Zenith, or point over your head, the measure of those Angles are in the Horizon. In this case the Angles make a Right-Angle in the Æquinoctial, and in the Zodiack, and in the Horizon, but in all other Angles of position, they are not to be measured Geometrically upon the Globe; so that such Angles, are only in proportion to the sides of an Oblique Angle, which is the neareſt distance of places upon the Globe; therefore those Angles are out of all proportion to the Rumb, and the Right-Lines of the Magnetick Compass; so that the work of Navigation, cannot be performed by the Arch of a Great Circle.

To Conclude, I have proved how all the known part of the World is laid down in the Meridians and Parallels of the Common Chart, in proportion to the Rumb, and the Right-lines of the Magnetick Compass.

I have proved how the Meridians and Parallels of all places in the Common Chart are transferred into the Meridians and Parallels of the Globe; in regard the difference of Meridians upon the Globe, does increaſe from the Poles to the Æquinoctial, and the difference of Meridians in the Common Chart, which is in proportion to the Rumb, and the Right-lines of the Magnetick Compaſs, are of equal diſtance, ſo that the difference of Meridians upon the Globe being Oblique, are out of all proportion to the Rumb and the Right Lines of the Magnetick Compaſs, without it be in the middle Parallel of places differing in Longitude and Latitude.

It is proved, *Mercator* divides his Plani-Sphere in proportion to the difference of Meridians upon the Globe: Therefore the Meridians of *Mercator* does not run in the Meridians of the Magnetick Compaſs, or the Meridians of the Common Chart, in regard the difference of Meridians upon *Mercators* Plani-Sphere, does increaſe from the Poles to the Æquinoctial, and the difference

rence of Meridians in the Common Chart, which is in proportion to the Rumb, and the Right-lines of the Magnetick Compaſs are of equal diſtance, which leads me to this conſideration; all points of the Magnetick Compaſs, as they are drawn, are of Right-lines, therefore the North and South point of the Magnetick Compaſs, does croſs the Eaſt and Weſt point of the Magnetick Compaſs at Right-Angles; ſo that it is proved by Obſervation, that the Eaſt and Weſt point of the Magnetick Compaſs, will direct you the Circulation of the Earth and Sea, in all Parallels of Latitude; then obſerve the North and South point of the Magnetick Compaſs as it is drawn, doth croſs the Eaſt and Weſt point of the Magnetick Compaſs at Right-Angles, in all Meridians and Parallels of the Earth and Sea. Therefore the difference of Meridians by the Magnetick Compaſs, muſt run Parallel in all Meridians and Parallels of the Earth and Sea, in proportion to the difference of the Parallels of Latitude, otherwiſe you may as well ſay the North and South

point

point of the Magnetick Compaſs, as it is drawn, doth not croſs the Eaſt and Weſt point of the Magnetick Compaſs at Right-Angles.

I have proved by Obſervation, that the Meridians of the Magnetick Compaſs, doth croſs the Eaſt and Weſt points of the Magnetick Compaſs at Right-Angles, in all Meridians and Parallels of the Earth and Sea; therefore the Meridians of the Magnetick Compaſs, muſt run Parallel to the Poles of Eaſt and Weſt, as the Parallels of the Magnetick Compaſs run Parallel to the Poles of North and South, ſo that the Common Chart is the only Truth in Navigation, in regard it is in proportion to the Rumb, and the Right-lines of the Magnetick Compaſs, therefore the Magnetick Compaſs doth meaſure the ſuperficies of the Globe by Right-lines, as if the ſuperficies of the Globe was a plain to the Horizon.

FINIS.

ADVERTISEMENT.

THere will be *Publiſhed the* Practical part of the Sea, *with ſome Queſtions in* Altronomy, *uſeful in* Navigation, *by the ſame Author.*

APPENDIX.

THE foregoing Treatiſe is onely upon a ſingle Queſtion in the three principal kinds of Sailing, ſo called, proving that the work of Navigation cannot be performed by the *Arch* of a *great Circle*, or by *Mercator*'s Poſition; and that the *Common Chart* that hath been ſo much rejected, is the *onely truth* in Navigation, in regard it is in proportion to the *Rumb* and the *right lines* of the Magnetick Compaſs; therefore I ſhall Illuſtrate this Poſition of the Common Chart by a double Queſtion in the practical part of the Sea, comparing it with the ſame Queſtion by *Mercator*'s Poſition; wherein the *defect* of *Mercator*'s Poſition will more plainly appear, than in a ſingle Queſtion.

Before I proceed to give this Queſtion, I ſhall ſhew you by what *Practical Queſtions* at Sea the work of Navigation is performed by the *Common Chart*, and by *Mercator*.

Firſt, by the *Common Chart*; if you have daily Obſervation, then you have the difference of Latitude and the Rumb rectified to all impediments to find the diſtance and the difference of Longitude in a right-lined Triangle.

By *Mercator*; if you have daily Obſervation, then you have the difference of Latitude in Meridional parts, and the Rumb rectified to all impediments to find the difference of Longitude in the Equinoctial.

The Second Queſtion in the Practical part of the Sea by the *Common Chart*; if you have no Obſervation for many days, and that you have run ſeveral traverſes, then you have your daily diſtance run by your Log, and the Rumb rectified to all impediments upon each traverſe, to find the difference of Latitude, and the difference of Longitude; this traverſe is

is called *a dead reckoning*; but as ſoon as you have Obſervation, having as before allowed for all impediments of the Rumb in your daily traverſe, and that you find the Ship *before* your Obſervation, or *aſtern* of your Obſervation, then you muſt add or ſubtract by a due proportion to each diſtance run by your Log, ſo as to fall into your Latitude by Obſervation: The ſeveral traverſes being thus reſolved, you muſt find the difference of Longitude, and the diſtance, and the Rumb upon which you have made your way from your laſt Obſervation in a right-lined Triangle, which is in proportion to the Rumb and the right lines of the Magnetick Compaſs.

The Second Queſtion in the Practical part of the Sea by *Mercator*. If you have no Obſervation for many days, and that you have run ſeveral traverſes, then you have your daily diſtance run by your Log, and the Rumb rectified to all impediments upon each traverſe, to find the difference of Longitude in the Equinoctial; this

traverſe is called a *dead reckoning*. Here you may obſerve *Mercator*'s brief Rules are not in proportion to the Rumb and Diſtance in a right-lined Triangle; therefore *Mercator* muſt take the Latitude of places as they are found in each traverſe in a right-lined Triangle, then *Mercator* has the Meridional parts contained in the difference of Latitude, and the Rumb in each right-lined Triangle, to find the difference of Longitude in the Equinoctial, which muſt be added or ſubtracted, as you increaſe or leſſen the Degrees of Longitude in the Equinoctial, until you come to ſhape a direct Courſe to your Port, according to *Mercator*'s Poſition, by a right-lined Triangle.

In the laſt place, having made ſeveral traverſes in the Sea, if you deſire to know a direct Courſe from your Ship to your Port in the *Common Chart*, you have the difference of Latitude between the Ship in the Sea and your Port; and the difference of Longitude between your Ship in the

Sea

Sea and the Port you are to ſail to, to find the Rumb and Diſtance upon a direct Courſe to your Port by a right-lined Triangle.

By *Mercator*, having made ſeveral traverſes in the Sea, if you deſire to know a direct Courſe to your Port, you have the difference of Latitude in Meridional parts between your Ship in the Sea and your Port, and the difference of Longitude in the Equinoctial between your Ship in the Sea, and the Port you are to ſail to, to find the Rumb and Diſtance upon a direct Courſe to your Port by a right-lined Triangle.

Having given you this *general* account of the Practical part of the Sea by the *Plain Chart*, and by *Mercator*'s Projection, I ſhall proceed to the *Queſtion*.

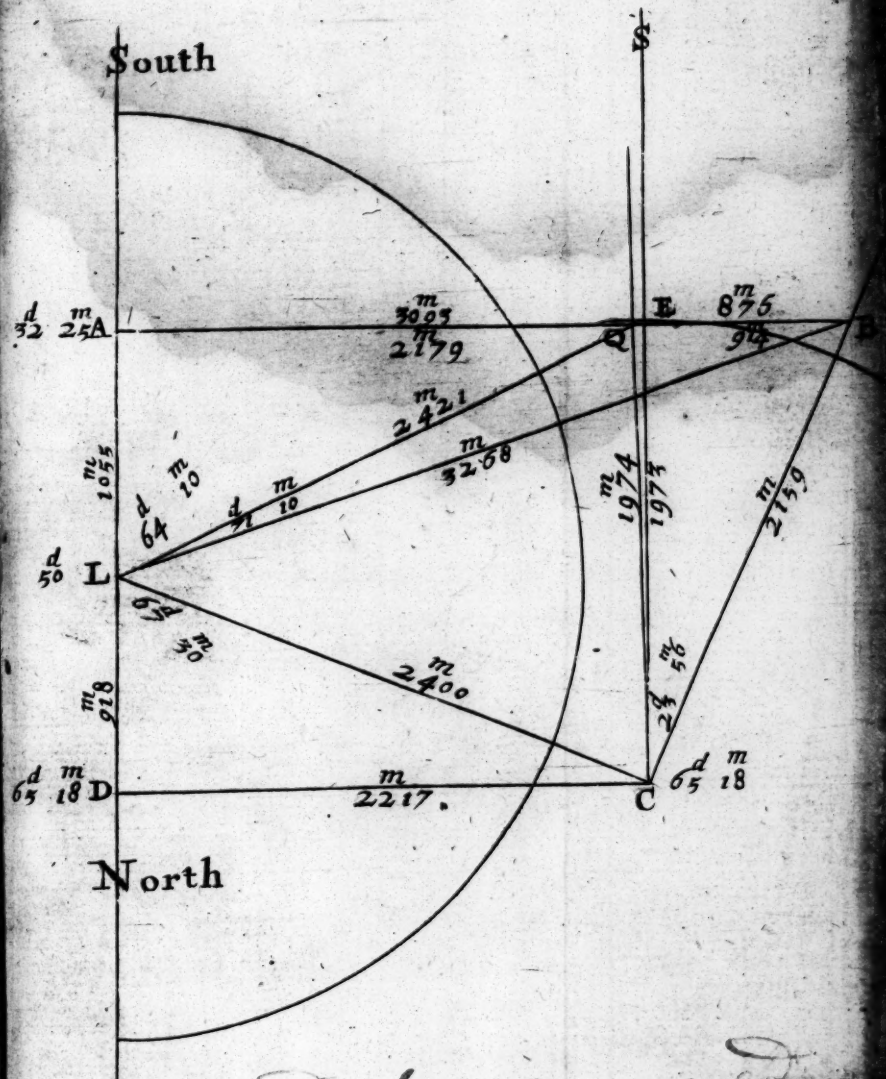
Two Ships Sail from the Lyzard *in the Latitude of* 50 d. *the firſt Ship Sails in an Angle of* 71 d. 10 m. *South-weſtwards* 3268 *miles*; *the ſecond Ship Sails Weſt North-weſt* 2400 *miles. I demand the Rumb or Courſe, and the*

diſtance that the ſecond Ship muſt ſail to arrive at the Port of the firſt Ship.

By the Common Chart.

The Queſtion of the firſt Ship is reſolved by demonſtration in the following Figure: The *Lyzard* Latitude 50 *d.* I ſail in an Angle of 71 *d.* 10 *m.* South-Weſtwards, A L B, 3268 miles L B. I demand the difference of Latitude, and the difference of Longitude? I anſwer, I find my difference of Latitude to be 1055 miles in the Latitude of 32 *d.* 25 *m.* L A. and my difference of Longitude to be 3093 miles, A B, which is the Meridian and Parallel of *Bermudus* in the *Common Chart*: I have reſolved the *Arithmetical* part of this Queſtion in the firſt part of this ſmall Treatiſe, which is in like proportion with the *Geometrical* part.

The Queſtion of the ſecond Ship in her firſt traverſe, is reſolved by demonſtration in the following Figure: The *Lyzard* Latitude 50 *d.* L. I ſail in



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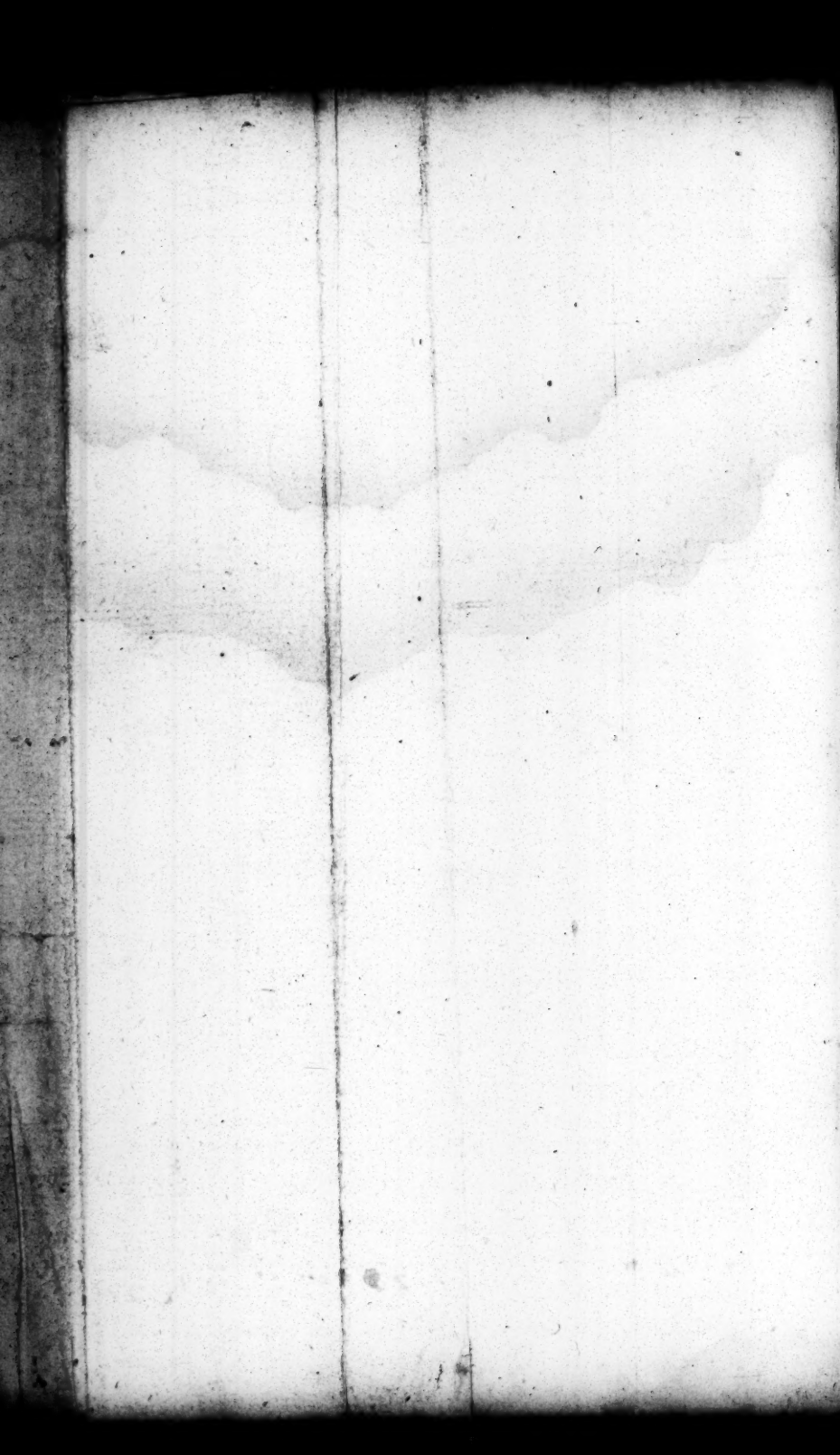


in an Angle of 67 *d.* 30 *m.* or Weſt North-weſt, D L C, 2400 miles, L C. I demand the difference of Latitude, and the difference of Longitude? I anſwer, I find my difference of Latitude to be 918 miles L D, in the Latitude of 65 *d.* 18 *m.* C; and I find my difference of Longitude to be 2217, D C, demanded.

The Queſtion of the ſecond Ship in her firſt traverſe reſolved Arithmetically, to find the difference of Longitude, ſay, *As the Radius* 90 d. *L D C*, 1000000, *is to to the Logarithm of the diſtance L C*, 2400 *miles*, 338021; *ſo is the ſine of the Rumb* 67 d. 30 m. *D L C* 996561, *to the Logarithm of the difference of Longitude* 334582, *or* 2217 *miles demanded.* Add the ſecond and third Numbers in all Queſtions, as I have given them, and you ſhall have the Sine, or the Tangent, or the Logarithm of the Numbers required.

The Queſtion of the ſecond Ship in her firſt traverſe reſolved Arithmetically, to find the difference of Latitude, ſay, *As the Radius* 90 d. *L D C*

1000000, *is to the Logarithm of the diſtance* 2400 *miles* L C, 338021, *ſo is the co-ſine of the Rumb* 67 d. 30 m. D L C 958283, *to the Logarithm of the difference of Latitude* 296304, *or* 918 *miles* L D. which agrees with the former demonſtration.

The Queſtion of the ſecond Ship in her ſecond traverſe is reſolved by demonſtration in the following Figure. In the firſt place, you muſt ſubtract the difference of Longitude the ſecond Ship has made upon a Weſt North-weſt Courſe D C 2217, from the difference of Longitude between the *Lyzard* and *Bermudus* A B 3093 miles, and you have E B 876 miles, that your Ship is to the Eaſtward of the Meridian of *Bermudus*; then add the difference of Latitude L D 918, to the difference of Latitude between the *Lyzard* and *Bermudus* L A 1055 miles, and you have 1973 miles D A, equal to C E, the difference of Latitude between the Ship and the Latitude of *Bermudus*. Then the Queſtion ſtands thus in proportion, you have

have the difference of Longitude between the Ship and *Bermudus* E B 876 miles, and the difference of Latitude between the Ship and the Latitude of *Bermudus* 1973 miles C E. I demand the Rumb and Diſtance I have to ſail to *Bermudus?* I anſwer, I find the Rumb to be in an Angle of 23 *d.* 56 *m.* E C B South-weſtwards, and I find the diſtance to be 2159 miles C B; ſo that the ſecond Ship is arrived in the Meridian and Parallel of *Bermudus* by Demonſtration, demanded.

The Queſtion of the ſecond Ship in her ſecond traverſe reſolved Arithmetically; to find the Rumb, ſay, *As the Logarithm of the difference of Latitude* 1937 *miles C E* 329512, *is to the Radius* 90 d. *C B E* 1000000; *ſo is the Logarithm of the difference of Longitude* 876 *miles E B* 294250, *to the tangent of the Rumb* 964738 *E C B* 23 d. 56 m. So that your Courſe from your Ship to *Bermudus* is in an Angle of 23 *d.* 56 *m.* South-weſtward, demanded.

The

The Queſtion of the ſecond Ship in her ſecond traverſe reſolved Arithmetically, to find the diſtance, ſay, *As the Sine of the Rumb* 23 d. 56 m. *ECB.* 960817; *is to the Logarithm of the difference of Longitude* 876 *miles EB* 294250; *ſo is the Radius* 90 d. *CEB* 1000000 *to the Logarithm of the diſtance* 333433 *CB* 2159 *miles*, the diſtance between the Ship in the Sea and *Bermudus*, demanded.

Then Obſerve, I have reſolved the Queſtion of the firſt Ship ſailing from the *Lyzard* to *Bermudus* Geometrically and Arithmetically, all which Poſitions are in proportion in a right-lined Triangle to the Rumb and the right lines of the Magnetick Compaſs and the Common Chart. Likewiſe I have reſolved the Queſtion of the ſecond Ship in a traverſe from the *Lyzard* to *Bermudus* Geometrically and Arithmetically; all which Poſitions are in proportion in right-lined Triangles to the Rumb, and the right lines of the Magnetick Compaſs and the Common Chart. So that the ſecond

ſecond Ship is arrived in the Meridian and Parallel of *Bermudus*. Therefore the ſecond Ship in her traverſe has not altered the difference of Longitude in the Equinoctial of the firſt Ship, as it was transferred from the Common Chart to the Globe, or *Mercator*.

The ſame Queſtion reſolved by Mercator.

I have given you a general account of the practical part of the Sea by the *Common Chart*, and by *Mercator*; ſo that all traverſes muſt be reſolved in proportion to the Rumb and the right lines of the Magnetick Compaſs, I ſhall proceed to the Queſtion.

Two Ships ſail from the Lyzard *in the Latitude of* 50 d. *the firſt Ship ſails in an Angle of* 71 d. 10 m. *Southweſtwards* 3268 *miles*; *the ſecond Ship ſails Weſt North weſt* 2400 *miles*. *I demand the Rumb and the Diſtance that the ſecond Ship muſt ſail to arrive at the Port of the firſt Ship.*

Before

Before I can reſolve this Queſtion by *Mercator*'s brief Rules, to find the difference of Longitude in the Equinoctial, I muſt ſee what Latitude is in proportion to the Rumb and Diſtance of the firſt Ship as it is found in a right-lined Triangle, in regard *Mercator*'s brief Rules are not in proportion to the Rumb and the Diſtance of places, then the Queſtion ſtands thus.

The Queſtion of the firſt Ship to be reſolved by *Mercator*'s brief Rules, the *Lyzard*, Latitude 50 *d.* *Bermudus*, Latitude 32 *d.* 25 *m.* the Rumb is an Angle of 71 *d.* 10 *m.* South-weſtwards: I demand the difference of Longitude in the Equinoctial?

To find the difference of Longitude in the Equinoctial, ſay, *As the Radius* 90 d. 1000000, *is to the difference of Latitude in Meridional parts* 1417: 315136, *ſo is the tangent of the Rumb* 71 d. 10 m. 1046714, *to the Logarithm of the difference of Longitude in the Equinoctial* 4155, 361850, *demanded.*

The

The Queſtion of the ſecond Ship in her firſt traverſe reſolved by *Mercator*'s brief Rules; before I can reſolve this Queſtion, I muſt ſee what Latitude is in proportion to the Rumb and Diſtance of the ſecond Ship in her firſt traverſe in a right-lined Triangle, in regard *Mercator*'s brief Rules are not in proportion to the Rumb and Diſtance; then the Queſtion ſtands thus:

The *Lyzard* Latitude 50 *d.* the ſecond Ship in her firſt traverſe, Latitude 65 *d.* 18 *m.* the Rumb Weſt North-weſt, or in an Angle of 67 *d.* 30 *m.* I demand the difference of Longitude in the Equinoctial?

To find the difference of Longitude in the Equinoctial, ſay, *As the Radius* 90 d. 1000000, *is to the Logarithm of the difference of Latitude in Meridional parts*, 1747, 324229; *ſo is the tangent of the Rumb* 67 d. 30 m. 1038277, *to the Logarithm of the difference of Longitude in the Equinoctial* 362502, *or* 4217 *miles, demanded.*

The Queſtion of the ſecond Ship in her ſecond traverſe reſolved by *Mercator*'s

cator's brief Rules: In the first place, you must observe, by the first traverse of the second ship the difference of Longitude in the Equinoctial is 4217 miles; therefore you must subtract the difference of Longitude in the Equinoctial (of the first ship) 4155 miles, and you have 62 miles, that the second ship in her second traverse is to the Westward of the Meridian of *Bermudus* in the Equinoctial, then the Question stands thus:

The second ship in her second traverse is in the Latitude of 65 *d.* 18 *m.* she is to sail into the Latitude of 32 *d.* 25 *m.* the whole difference of Longitude in the Equinoctial between the second ship in her second traverse and *Bermudus* is 62 miles East. I demand the Rumb or Course, and the distance the second ship in her second traverse must sail, to arrive at the Port of the first ship?

To find the Rumb, say, *As the Logarithm of the difference of Latitude in Meridional parts* 3164, 350023, *is to the Radius* 1000000, *so is the Logarithm*

rithm of the whole difference of Longitude in the Equinoctial 62 *miles*, 179239, *to the tangent of the Rumb* 829216, *or* 01 d. 07 m. So that I am to ſail in an Angle of 01 *d.* 07 *m.* South-Eaſtward from the place of my ſhip in her laſt traverſe, to arrive at *Bermudus*: Then obſerve, *Mercator* has altered the Rumb from that of the *Common Chart* 25 *d.* 03 *m.* To prove it, add 01 *d.* 07 *m.* that the ſecond ſhip in her ſecond traverſe ſails by *Mercator* South-Eaſtward into the Latitude of *Bermudus*, to 23 *d.* 56 *m.* that the ſecond ſhip in her ſecond traverſe has ſailed South-Weſtward upon the *Common Chart* to *Bermudus*, and you have 25 *d.* 03 *m.* that the Rumb differs between the *Common Chart* and *Mercator*; theſe are *groſs errors* in Navigation, therefore I ſhall ſhew you wherein *Mercator* commits them.

In the next place, I ſhall reſolve the remaining part of *Mercator*'s Navigation by right-lined Triangles in proportion to the Rumb found by *Mercator*'s brief Rules; for all tra-

verſes muſt be reſolved by the Rumb and the right lines of the Magnetick Compaſs, in regard *Mercator*'s brief Rules are not in proportion to the Rumb and the diſtance ſailed; otherwiſe you cannot tell upon what Rumb or Courſe you have ſailed from your firſt Port upon a traverſe, or upon what Rumb or Courſe you are to return to your Port, or to any other part of the World: Then obſerve, if the Rumb and the difference of Latitude found by *Mercator* in a traverſe by the ſecond Ship, does not make out the ſame Rumb and diſtance that the firſt Ship made from the *Lyzard* to *Bermudus*, then it muſt be granted that *Mercator*'s brief Rules have led you into groſs Errors; this I ſhall prove from the Practical part of the Sea.

I ſhall not be tedious, therefore I ſhall give the Queſtions reſolved.

By *Mercator*, the firſt Ship ſails from the *Lyzard* in the Latitude of 50 *d.* at L, in an Angle of 71 *d.* 10 *m.* A L B, South-weſtwards 3268 miles L B; I de-

demand the difference of Latitude, and the difference of Longitude in a right-lined Triangle? I anſwer, I find my difference of Latitude 1055 miles, and to be in the Latitude of 32 *d.* 25 *m.* L A; and I find my difference of Longitude 3093 miles A B, demanded.

By *Mercator*, the ſecond Ship in her firſt traverſe ſails from the *Lyzard* in the Latitude of 50 *d.* at L, in an Angle of 67 *d.* 30 *m.* D L C, North-weſtward 2400 miles L C. I demand the difference of Latitude, and the difference of Longitude in a right-lined Triangle? I anſwer, I find my difference of Latitude 918 miles, and to be in the Latitude of 65 *d.* 18 *m.* L D; and I find my difference of Longitude 2217 miles D C, demanded.

By *Mercator*, the ſecond Ship in her ſecond traverſe ſails from the Latitude of 65 *d.* 18 *m.* at C, in an Angle of 01 *d.* 07 *m.* South-eaſtwards Q C E, into the Latitude of 32 *d.* 25 *m.* Q C. I demand the diſtance ſailed, and the difference of Longitude in a right-lined Triangle? I anſwer, I find the diſtance

C Q 1974 miles; and I find my difference of Longitude Q E, 39 miles Eaſt, demanded.

Then ſubtract the difference of Longitude of the ſecond Ship in her ſecond traverſe Q E 39 miles, from the difference of Longitude of the ſecond ſhip in her firſt traverſe D C 2217 miles, in regard the ſecond Ship in her ſecond traverſe is gone to the Eaſtward, and you have 2179 miles Q A, the difference of Longitude the ſecond Ship has made from the *Lyzard* into the Latitude of *Bermudus*.

Then ſubtract the difference of Longitude the ſecond Ship has made from the *Lyzard* into the Latitude of *Bermudus* Q A 2179 miles, from the difference of Longitude the firſt Ship has made to *Bermudus* in the Latitude of 32 *d.* 25 *m.* A B 3093 miles, and you have 914 Q B, or 15 *d.* 14 *m.* that *Mercator* is to the Eaſtward of the Meridian and Parallel of *Bermudus*, when *Mercator* expects to be in the Meridian and Parallel of *Bermudus*.

In

In the laſt place, you have the difference of Latitude between the *Lyzard* and *Bermudus* L A 1055 miles, and the difference of Longitude 2179 miles A Q; I demand the Rumb and the diſtance the ſecond Ship has ſailed from the *Lyzard* into the Latitude of *Bermudus* upon a direct Courſe? I anſwer, I have ſailed in an Angle of 64 *d.* 10 *m.* A L Q. South-weſtward; and I find my diſtance ſailed 2421 miles L Q demanded; at which place *Mercator* expects to be in the Meridian and parallel of *Bermudus*; then ſubtract the Rumb of the ſecond ſhip from the *Lyzard* upon a direct Courſe A L Q 64 *d.* 10 *m.* when *Mercator* expects to be in the Meridian and parallel of *Bermudus*, from the Rumb of the firſt ſhip from the *Lyzard* to *Bermudus* A L B, 71 *d.* 10 *m.* and you have 07 *d.* 00 *m.* that the Angle of the poſition does differ between the firſt and ſecond ſhip; then ſubtract the diſtance of the ſecond ſhip L Q 2421 miles, from the diſtance of the firſt ſhip L B 3268 miles, and you have

847

847 miles, that the ſecond ſhip does differ from the firſt ſhip; likewiſe ſubtract the difference of Longitude of the ſecond ſhip 2179 miles A Q, from the difference of Longitude of the firſt ſhip 3093 miles A B, and you have 914 miles, or 15 *d.* 14 *m.* that the ſecond ſhip is to the Eaſtward of *Bermudus* in the Latitude of 32 *d.* 25 *m.* Theſe are the groſs Errors that attend *Mercator*'s Poſition; for all traverſes by *Mercator* in the practical part of the Sea, muſt be reſolved by right-lined Triangles, otherwiſe you cannot give any account of the Rumb and the diſtance, and the difference of Longitude your ſecond ſhip has made from her firſt Port, or that you can give any account upon what Rumb you are to return to your Port, or to direct your courſe to any other Port, if you do not reſolve all traverſes by the Rumb and the right lines of the Magnetick Compaſs in right-lined Triangles; therefore it muſt be granted, that I am to find the difference of Longitude in the Equinoctial that the ſecond ſhip has made in her traverſe from the *Lyzard* to be in proportion to the Rumb upon a direct Courſe by *Mercator*.

In the laſt place, I muſt find the difference of Longitude in the Equinoctial that the ſecond ſhip has made upon a direct Courſe from the *Lyzard* into the Latitude of 32 *d.* 25 *m.* In the laſt Queſtion, the Rumb is found to be in an Angle of 64 *d.* 10 *m.* South-weſtward

that

that the ſecond ſhip has made in her traverſe from the *Lyzard* upon a direct Courſe into the Latitude of 32 *d.* 25 *m.* then you have the Latitude of the *Lyzard* 50 *d.* and the Latitude of 32 *d.* 25 *m.* and the Rumb 64 *d.* 10 *m.* South-weſtward; I demand the difference of Meridians in the Equinoctial that the ſecond ſhip has made from the *Lyzard* into the Latitude of 32 *d.* 25 *m.*? I anſwer, the difference of Meridians in the Equinoctial is found to be 2926 miles, when *Mercator* expects to be in the Meridian of the Equinoctial equal to the firſt ſhip; then ſubtract the difference of Meridians in the Equinoctial of the ſecond ſhip 2926 miles, from the difference of meridians of the firſt ſhip in the Equinoctial 4155 miles, and you have 1229 miles, or 20 *d.* 29 *m.* that the ſecond ſhip is Eaſt of the firſt ſhip in the Equinoctial, when *Mercator* expects to be in the meridian of the Equinoctial with the firſt ſhip; ſo that *Mercator* hath altered the Rumb, and the diſtance, and the difference of meridians of the ſecond ſhip in a right-lined Triangle, and in the Equinoctial, from the Rumb, and the diſtance, and the difference of meridians of the firſt ſhip in a right-lined Triangle, and in the Equinoctial: So that to know the difference of Longitude in the Equinoctial is no way *uſeful* in Navigation, either upon the Globe, or upon *Mercator*'s Plani-Sphere.

I have proved by the *Common Chart*, that the ſecond ſhip making a traverſe, is arrived in the meridian of the firſt ſhip, and has not altered the meridian of the firſt ſhip in the *Common Chart*, or in the Equinoctial, as it is transferred to the Globe: I have ſatisfied the World that the *Common Chart* in the Practical part of the Sea, is the only *true Chart* in Navigation; if otherwiſe, I deſire to be better informed: Therefore it muſt be granted, that the Magnetick Compaſs as it is *Horizontal*, runs parallel to the *Poles* of *Eaſt* and *Weſt*, as it runs parallel to the *Poles* of *North* and *South*, and is as much in proportion by *Obſervation* and *Demonſtration* to thoſe Poles, as the Poles *Ecliptick* are in *proportion* to any Queſtion in *Aſtronomy*.

FINIS.

Addenda.

The following Treatiſe will prove Mercator's *practical Rules in Navigation, to be notoriouſly falſe.*

Likewiſe Longitude not to be found by Obſervation, from the Celeſtial Bodies, without it be when Eclipſes appear in the Equinoctial.

Laſt of all, the Earth is proved to be the Centre of the Starry Heaven.

All which is proved by Obſervation and Demonſtration.

THE laſt Appendix to the foregoing Treatiſe was a Queſtion given me, the Anſwer I gave to it, I thought ſufficient to have given ſatisfaction to any reaſonable Men, wherein I prove the Work of Navigation cannot be performed by *Mercator's* brief Rules; but finding Mr. *Flamſteed* and other of our Shore Navigators to diſcourſe in Company in deriſion of

what I have offered publickly to the World; I muſt tell him, it is not becoming a Man of his Quality, but I hope this following Treatiſe may induce Mr. *Flamſteed* and the reſt, to let the World ſee ſome of their skill in Navigation, and to doe me ſo much right as to allow or diſprove what I have offered that Men may not halt between Opinions; however I ſhall make ſome ſmall alteration in the Queſtion in the foregoing Appendix, and give the Queſtion more Practical in Navigation, wherein all Men that are Studious in Navigation may give an Anſwer to all Objections any man ſhall propoſe, in oppoſition to what I have offered: for the Rules of Navigation are Demonſtrative, and the Arithmetical Rules muſt be in proportion, otherwiſe ſuch Rules muſt be rejected; therefore I ſhall reſolve the following Queſtion by the Plain Chart, and by *Mercator*, wherein I ſhall ſhew you how far *Mercator*'s brief Rules are in proportion in each Traverſe to the Rumb, and the Right-lines of the Mag-

Magnetick Compaſs: then I ſhall ſhew you in the following Queſtion, wherein *Mercator*'s Practical Rules in Navigation do diſagree with the Rumb and the Right-lines of the Magnetick Compaſs, by which *Mercator* pretends to Navigate; which will prove *Mercator*'s Poſition in the Practical Parts of Navigation to be notorious falſe; as likewiſe are all thoſe that are of his perſuaſion, without they will ſatisfie the World to the contrary. Laſtly, as the Meridian and Parallel of all the known part of the World cannot be found in the practical part of Navigation, by the Arch of great Circle, or by *Mercator*'s brief Rules, ſo likewiſe the Meridian and Parallel of places cannot be transferred from the Common Chart to the Globe, but onely from one Meridian and Parallel of the Common Chart by ſuch Demonſtrations; you ſhall have the ſame Latitude and Diſtance of places to all the known Parts of the World, upon the Globe as it is transferred from onely one Meridian and Parallel of the Common Chart

to the Globe: otherwiſe the Meridian and Parallel of places cannot be known upon the Globe as they are found by the Practical part of Navigation. All which I ſhall prove at large.

The Queſtion given is as following.

EXAMPLE.

Two Ships ſail from the *Lyzard* in the Latitude of 50 *d.* the firſt Ship ſails in an Angle of 71 *d.* 10 *m.* South-Weſtward 3268 miles; the ſecond Ship ſails in an Angle of 67 *d.* 30 *m.* North-Weſtward 2400 miles, then the ſecond Ship ſails in an Angle of 23 *d.* 56 *m.* South-weſt-ward 2159 miles, I demand the difference of Longitude in each right lined Triangle, and the Latitude the firſt and ſecond Ship was in upon each Rumb and diſtance ſailed; and the difference of Longitude in the Equinoctial contained in each right lined Triangle.

This Queſtion muſt be reſolved by right lined Triangles, which are in pro-

proportion with the Common Chart, otherwiſe the Latitude upon each diſtance runn cannot be known, in regard *Mercator*'s brief Rules are not in proportion to the Rumb, and the diſtance of places, therefore I ſhall give you the Queſtion reſolved by right lined Triangles in the Practical part of the Sea, according to the Common Chart, and proceed to *Mercator*'s brief Rules in the Practical part of the Sea.

I. The firſt Ship ſails from the *Lyzard* in the Latitude of 50 *d.* L in an Angle of 71 *d.* 10 *m.* South-weſt-ward, A L B, 3268 miles, L B. I find my difference of Latitude 1055 miles, South, and to be in the Latitude of 32 *d.* 25 *m.* L A, likewiſe I find my difference of Longitude to be 3093 miles, Weſt A B, which is the Meridian and Parallel of *Barmudas* upon the Common Chart, to which the Arithmetical Rules are in proportion.

II. The ſecond Ship in her firſt Traverſe ſails from the *Lyzard* in the La-

titude of 50 *d.* L, in an Angle of 67 *d.* 30*m.* D L C, 2400 miles L. C. I find my difference of Latitude to be 918 miles, North L D, and to be in the Latitude of 65 *d.* 18 *m.* at C, likewise I find my difference of Longitude to be 2217 miles West D C, demanded, to which the Arithmetical Rules are in proportion.

III. The second Ship in her second Traverse sails from C, in the Latitude of 65 *d.* 18 *m.* in an Angle of 23 *d.* 56 *m.* South-west-wards E C B, 2159 miles C B, I find my difference of Latitude to be 1973 miles South, and to be in the Latitude of 32 *d.* 25 *m.* at B, likewise I find my difference of Longitude to be 876 miles West, E B, demanded, to which the Arithmetical rules are in proportion.

To summ up the Practical part of Navigation, according to the Common Chart, and to give you the Meridian and Parallel of the second Ship in her first and second Traverse; first you must add the difference of Longitude the second Ship made in her second

Taverse,

Traverſe, 876 miles, E B, to the difference of Longitude the ſecond Ship made in her firſt Traverſe 2217 miles, D C, and you have 3093 miles, A B, the difference of Longitude of the ſecond Ship in her firſt and ſecond Traverſe from the *Lyzard*, where ſhe meets the firſt Ship in the Latitude of 32 *d.* 25 *m.* which is the Meridian and Parallel of the ſecond Ship in her firſt and ſecond Traverſe. See the Demonſtration which is according to the Common Chart.

Having found the Latitudes and the difference of Longitudes in each right lined Triangle that the firſt and ſecond Ship was in, upon each Traverſe according to the plain Chart, I ſhall proceed to ſhew you how far *Mercator's* brief Rules are in proportion to the Rumb and the right lines of each right lined Triangle, in the foregoing Queſtion, Then I ſhall ſhew you wherein *Mercator's* Practical Rules in Navigation diſagree.

By MERCATOR.

In the first place, I shall shew you that the Rumb and the difference of Latitude in Meridional parts is in proportion to the difference of Longitude in the Equinoctial in each right lined Triangle: In the next place, I shall shew you that the Meridional parts contained in the difference of Latitude and the difference of Longitude in the Equinoctial, and the difference of Latitude is in proportion to the difference of Longitude in each right lined Triangle, of the foregoing Question: In the third place, I shall shew you that *Mercator's* Practical Rules in Navigation do disagree with the foregoing Rules of *Mercator*, in each Traverse; In regard the difference of Latitude in Meridional parts from the *Lyzard*, to the second Ship in her second Traverse, and the difference of Longitude in the Equinoctial found according to *Mercator's* Practical Rules in Navigation, and the difference of Latitude

Latitude between the ſecond Ship in her ſecond Traverſe from the *Lyzard*, doth not give the ſame difference of Longitude, in a right lined Triangle from the *Lyzard* to the ſecond Ship in her ſecond Traverſe, in proportion to the difference of Longitude, found in each ſingle Traverſe in a right lined Triangle. This being proved, *Mercator's* Practical Rules in Navigation muſt be notorious falſe.

The Queſtions to be Reſolved by Mercator's *brief Rules, are as followeth.*

EXAMPLE.

1. To find the difference of Longitude in the Equinoctial, in proportion to the foregoing Queſtion, The firſt Ship ſails from the *Lyzard*, in the Latitude of 50 *d.* L, in an Angle of 71 *d.* 10 *m.* A L B, South-weſt-ward into the Latitude of 32 *d.* 25 *m.* at B. I demand the difference of Longitude in the Equinoctial.

To Reſolve this Queſtion, ſay as the *Radius* 90 *d.* 1000000 is to the Logarithm of the difference of Latitude in Meridional parts 1417, 315136, ſo is the Tangent of the Rumb, 71 *d.* 10 *m.* 1046714, to the Logarithm of the difference of Longitude in Equinoctial 361850 or 4155 miles, or 69 *d.* 15 *m.* demanded.

2. To find the difference of Longitude in the Equinoctial, in proportion to the foregoing Queſtion, the ſecond Ship ſails from the *Lyzard* in the Latitude of 50 *d.* L in an Angle of 67 *d.* 30 *m.* D L C North-weſt-ward into the Latitude of 65 *d.* 18 *m.* at C. I demand the difference of Longi. in the Equinoctial.

To Reſolve this Queſtion, ſay as the *Radius* 90 *d.* 1000000 is to the Logarithm of the difference of Latitude in Meridional parts, 1748, 324254, So is the Tangent of the Rumb, 67 *d.* 30 *m.* 1038277, to the Logarithm of the difference of Longitude in the Equinoctial 362531, or 4220 miles or 70 *d.* 20 *m.* demanded.

3. To

3. To find the difference of Longitude in the Equinoctial, in proportion to the foregoing Queſtion, the ſecond Ship in her ſecond Traverſe ſails from C, in the Latitude of 65 *d.* 18 *m.* in an Angle of 23 *d.* 56 *m.* EC B, South-weſtwards, into the Latitude of 32 *d.* 15 *m.* I demand the difference of Longitude in the Equinoctial.

To Reſolve this Queſtion, ſay as the *Radius* 90 *d.* 1000000 is to the Logarithm of the difference of Latitude in Meridional parts 3165, 350037. So is the Tangent of the Rumb, 23 *d.* 56 *m.* 964722, to the Logarithm of the difference of Longitude in the Equinoctial, 314759, or 1405 miles, or 23 *d.* 25 *m.* demanded.

To ſumm up the Practical part of the ſecond Ship, in her firſt and ſecond Traverſe, according to *Mercator*, you muſt add the difference of Longitude in the Equinoctial; the ſecond Ship made in her ſecond Traverſe 23 *d.* 25 *m.* to the difference of Longitude in the Equinoctial; the ſecond Ship made in her firſt Traverſe 70 *d.* 20 *m.*

and

and you have 93 *d.* 45 *m.* the difference of Longitude in the Equinoctial of the ſecond Ship from the *Lyzard*, in the Latitude of 32 *d.* 25 *m.* Thus I have given you a full accompt of *Mercator*'s Practical Rules in Navigation.

Having given you a brief accompt of the Practical part of Navigation, according to the Common Chart, and according to the brief Rules of *Mercator*, I ſhall proceed to ſhew you how the Meridional parts, contained in the difference of Latitude, and the difference of Longitude in the Equinoctial, and the difference of Latitude in each ſingle Traverſe, according to *Mercator*, is onely in proportion to the difference of Longitude, contained in each ſingle Traverſe in all right lined Triangles; Then I ſhall ſhew you that the like Rules of *Mercator* are out of all proportion with the difference of Longitude, in a right lined Triangle from the *Lyzard* according to his Practical Rules in Navigation, the Queſtions to be Reſolved by *Mercator*'s brief Rules are as follow in Example.

1. The

1. The first Ship sails from the *Lyzard*, Latitude 50 *d.* into the Latitude of 32 *d.* 25 *m.* I find my difference of Latitude in Meridional parts 1417 the difference of Longitude in the Equinoctial is 4155 miles; the difference of Latitude is 1055 miles. I demand the difference of Longitude, in a right lined Triangle that the first Ship made according to the Common Chart from the *Lyzard*, A B.

To find the difference of Longitude of the first Ship in a right lined Triangle, according to *Mercator's* brief Rules, say as the Logarithm of the Meridional parts contained in the difference of Latitude 1417, 315136, is to the Logarithm of the difference of Longitude in the Equinoctial 4155 miles, 361857. So is the Logarithm of the difference of Latitude 1055 miles, 302325, to the Logarithm of the difference of Longitude, in a right lined Triangle, 349046, or 3093 miles, which is equal to the difference of Longitude, the first Ship made in a right lined Triangle. See the fore-

going

going Demonſtration, according to the Common Chart, A B.

2. The ſecond Ship ſails from the *Lyzard*, Latitude 50 *d.* into the Latitude of 65 *d.* 18 *m.* I find my difference of Latitude in Meridional parts 1748. The difference of Longitude in the Equinoctial, is 4220 miles, the difference of Latitude is 918 miles, I demand the difference of Longitude, in a right lined Triangle, that the ſecond Ship made according to the Common Chart, from the *Lyzard*, D C.

To find the difference of Longitude of the ſecond Ship, in her firſt Traverſe, in a right lined Triangle, according to *Mercator's* brief Rules, ſay as the Logarithm of the Meridional parts contained in the difference of Latitude, 1748, 324254; is to the Logarithm of the difference of Longitude in the Equinoctial; 4220 miles, 362531, ſo is the Logarithm of the difference of Latitude, 918 miles, 296284 to the Logarithm of the difference of Longitude, in a right lined Triangle 334561

or

or 2217 miles, which is equal to the difference of Longitude, the ſecond made in a right lined Triangle in her firſt Traverſe. See the foregoing Demonſtration, according to the Common Chart, D C.

3. The ſecond Ship ſails from C. in the Latitude of 65 *d.* 18 *m.* into the Latitude of 32 *d.* 25 *m.* I find my difference of Latitude in the Meridional parts, 3165. The difference of Longitude, in the Equinoctial is 1405 miles, the difference of Latitude is 1973 miles; I demand the difference of Longitude, in a right lined Triangle; that the ſecond Ship made in her ſecond Traverſe, according to the Common Chart from E to B.

To find the difference of Longitude, the ſecond Ship made in her ſecond Traverſe, in a right lined Triangle; ſay as the Logarithm of the Meridional parts, contained in the difference of Latitude 3165, 350037, is to the Logarithm of the difference of

Lon-

Longitude in the Equinoctial 1405 miles, 314767. So is the Logarithm of the difference of Latitude 1973 miles 329512 to the Logarithm of the difference of Longitude, in a right lined Triangle, 294242 or 876 miles which is equal to the difference of Longitude, the ſecond Ship made in a right lined Triangle, in her ſecond Traverſe: See the foregoing Demonſtration according to the Common Chart; then add the difference of Longitude the ſecond Ship made in a right lined Triangle in her firſt Traverſe, 2217 miles found according to *Mercator*'s brief Rules to the difference of Longitude, the ſecond Ship made in a right lined Triangle in her ſecond Traverſe 876 miles, found according to *Mercator*'s brief Rules; and you have 3093 miles equal to the difference of Longitude, the firſt Ship made in a right lined Triangle 3093: So that *Mercator*'s brief Rules are in proportion to the Rumb, and the difference of Latitude and the difference of Longitude in all ſingle Queſtions, in a right lined Tri-

angle

angle. See the forgoing Demonſtration which proves the Practical part of Navigation, performed by the ſecond Ship, according to the Common Chart, to be in the Meridian and Parallel of the firſt Ship.

In the laſt place, I ſhall prove that the like Rules in the practical part of *Mercator's* Navigation, will not give like difference of Longitude contained in the Traverſe of the ſecond Ship, in a right lined Triangle from the *Lyzard* 3093 miles, which will prove *Mercator's* practical Poſition in Navigation to be notoriouſly falſe, for in the plaineſt Rules of Art where propoſitions ſhall diſagree, we are to reject them. The Queſtion is as following.

EXAMPLE.

According to *Mercator's* Practical Rules in Navigation, the ſecond Ship in her ſecond Traverſe, is in the Latitude of 32 *d.* 25 *m.* the *Lyzard* in the Latitude of 50 *d.* The difference of Latitude in Meridional parts, 1417;

the difference of Longitude in the Equinoctial, according to *Mercator's* practical Rules in Navigation is 93 *d.* 45 *m.* or 5625 miles. The difference of Latitude is 1055 miles. I demand the difference of Longitude in a right lined Triangle, between the *Lyzard* and the Ship in her second Traverse.

To find the difference of Longitude, in a right lined Triangle, say as the Logarithm of the Meridional parts, contained in the difference of Latitude 1417, 315136 is to the Logarithm of the difference of Longitude in the Equinoctial, 5625 miles 375012 So is the Logarithm of the difference of Latitude 1055 miles, 302325 to the Logarithm of the difference of Longitude in a right lined Triangle, 362201 or 4188 miles between the *Lyzard* and the Ship, in the Latitude of 32 *d.* 25 *m.* demanded.

Then subtract the difference of Londitude found by the like Rules of *Mercator*, in each Traverse in a right lined Triangle 3093 miles from the *Lyzard* to the Ship, in the Latitude of

32 *d.*

32 *d.* 25 *m.* from the difference of Longitude, found by the like Rules of *Mercator*, in a right lined Triangle, according to *Mercator*'s practical Rules in Navigation 4188 miles, and you have 1095 miles or 18 *d.* 15 *m.* that *Mercator*'s practical Rules in Navigation doth differ from *Mercator*'s practical Rules in each Traverſe, in a right lined Triangle in the Latitude of 32 *d.* 25 *m.* So that *Mercator* doth alter the Rumb and the diſtance and the difference of Longitude in the practical part of Navigation, from the *Lyzard* 1095 miles or 18 *d.* 15 *m.* more Weſt in the Latitude of 32 *d.* 25 *m.* Therefore *Mercator*'s Poſition in the practical part of Navigation is notoriouſly falſe; for in the plaineſt Rules of Art where propoſitions ſhall diſagree we are to reject them.

To ſumm up the foregoing Treatiſe, In the firſt place, I have proved the plain Chart, that has been rejected by all Writers, to be the onely true Chart in Navigation, by Obſervation and Demonſtration to which the Arithme-

tical Rules are in proportion. Secondly, I have proved *Mercator*'s Arithmetical Rules, to be out of all proportion in the practical part of Navigation; and Geometry, In regard the whole Dependants of *Mercator*'s Navigation, is upon his brief Rules in Arithmetick; which Rules disagreeing, disappoints the Design of Geometry: Therefore the work of Navigation cannot be performed by *Mercator*: Thirdly, I have proved the Art of Navigation cannot be performed by the Arch of a great Circle; In regard the Arch of a great Circle doth measure the nearest distance of places in North and South Latitude without having any regard to the Parallels of Latitude; so that the Angles of Position in the Arch of a great Circle doth differ from the Angles of Position, by the Magnetick Compass. See the foregoing Demonstrations: So that you cannot give the Question as it stands in the practical part of Navigation to find the Meridian and Parallel the Ship is in by the Arch of a great Circle; neither can the Meridian

ridian and Parallel of places be known upon the Globe, but as it is transferred to the Globe from the Common Chart, of which I ſhall give you a farther Account in the following Diſcourſe. The chief intent of this Treatiſe, is principally for Information, that all Men may give an Accompt of the Certainty of Navigation: Therefore I deſire Mr. *Flamſteed*, and the reſt of our Shore Navigators, to let the World ſee ſomething of their skill in Navigation, and that they will not hide their Talent in a Napkin, but allow or diſprove what I have made publick to the World, which I expect from them.

To transfer the Meridian and Parallel of places from the Common Chart, to the Globe.

As the Meridian and Parallel of places, cannot be found by *Mercator*'s practical Rules in Navigation, or by the Arch of a great Circle; ſo likewiſe you cannot transfer the

Meridian and Parallel of places from the Common Chart, to the Globe; but it muſt be transferred onely from one Meridian and Parallel of the Common Chart.

Then by the following Demonſtration, by which I transfer the Meridian and Parallel of places from the Common Chart to the Globe: You ſhall have the ſame Latitude and diſtance of places upon the Globe, as is upon the Common Chart, from that Meridian and Parallel from whence it is transferred, otherwiſe the Meridian and Parallel of places cannot be known upon the Globe, as it is found by the practical Part of Navigation.

To transfer the Meridian and Parallel of Places, from the Common Chart to the Globe.

EXAMPLE.

1. In the Common Chart, the firſt Ship ſails from the *Lyzard*, L in the Latitude of 50 *d.* into the Latitude of

32 *d.*

32 *d.* 25 *m.* B, her diſtance ſailed is 3268 miles or 54 *d.* 28 *m.* L B, then take with your Compaſs 54 *d.* 28 *m.* L B, from the Equinoctial part of your Globe; placing one Foot of your Compaſs in the Latitude of 50 *d.* of your Globe for the Meridian and Parallel of the *Lyzard*, then turn the Globe Eaſt, in regard your Ship is gone to the Weſt-ward, untill the other point doth cutt under the Braſs Meridian of the Globe, in the Latitude of 32 *d.* 25 *m.* there make a Mark which is the Meridian and Parallel of the firſt Ship upon the Globe. To prove the Truth of this Demonſtration, obſerve the difference of Longitude between the Meridian of the *Lyzard* and the Meridian of your Mark, in the Equinoctial part of your Globe is 69 *d.* 15 *m.* as it was found by the brief Rules of *Mercator*. So that you have three certain diſtances upon the Globe, as is in a right lined Triangle; that is the difference of Latitude and the diſtance of places, and the difference of Longitude in the middle Parallel

rallel. I ſhall proceed to the ſecond Ship.

2. To transfer the Meridian and Parallel of the ſecond Ship, in her firſt Traverſe, from the Meridian and Parallel of the *Lyzard*, according to the Common Chart, to the Globe. Example in the Common Chart, the ſecond Ship ſailed from the *Lyzard* L in the Latitude of 50 *d.* into the Latitude of 65 *d.* 18 *m.* C her diſtance ſails is 2400 miles or 40 *d.* L C, then take with your Compaſs 40 *d.* from the Equinoctial part of your Globe, placing one Foot in the Latitude of 50 *d.* as you did before for the Meridian and Parallel of the *Lyzard:* Then turn the Globe Eaſt-ward, in regard your Ship is gone to the Weſtward, untill the other point doth cutt under the Braſs Meridian, in the Latitude of 65 *d.* 18 *m.* there make a Mark which is the Meridian and Parallel of the ſecond Ship in her firſt Traverſe, from the *Lyzard*, upon the Globe. To prove the Truth of this Demon-

Demonſtration, obſerve the difference of Longitude between the Meridian of the *Lyzard* and the Meridian of your mark in the Equinoctial part of your Globe is 70 *d.* 20 *m.* as it was found by the brief Rules of *Mercator*; ſo that you have Three certain diſtances upon the Globe, as is in a right lined Triangle, that is the difference of Latitude and the diſtance of places, and the difference of Longitude in the middle Parallel. I ſhall proceed to the ſecond Ship in her ſecond Traverſe.

To transfer the Meridian and Parallel of the ſecond Ship, in her ſecond Traverſe, from the Meridian and Parallel of the *Lyzard*, according to the Common Chart, to the Globe, Example the ſecond Ship in her ſecond Traverſe, ſails from C in the Latitude of 65 *d.* 18 *m.* in an Angle of 23 *d.* 56 *m.* South-weſt-ward 2159 miles to B and meets the firſt Ship, in the Latitude of 32 *d.* 25 *m.* at B, ſo that the diſtance of the ſecond Ship from the *Lyzard*, B L is 3268 miles, and is equal to the diſtance of the firſt Ship from

from the *Lyzard*, B L, 3268. Therefore the Latitude of the *Lyzard* 50 *d.* L and the Latitude of the ſecond Ship in her ſecond Traverſe 32 *d.* 25 *m.* B and the diſtance of the ſecond Ship in her ſecond Traverſe from the *Lyzard* 3268 miles B L or 54 *d.* 28 *m.* is in the like proportion to the Meridian and Parallel of the firſt Ship in the Common Chart, as it is transferred to the Globe, from the Common Chart, and is in the like proportion to the difference of Longitude in the Equinoctial of the firſt Ship from the *Lyzard* 69 *d.* 15 *m.* This Demonſtration muſt be Infallibly True, in regard *Mercator*'s brief Rules, and the Rules of the Globe are in proportion to the difference of Longitude in all right lined Triangles; as in the foregoing Triangle between A and B.

In the laſt place, I ſhall prove the Meridian and Parallel of all the known parts of the World, muſt be onely transferred from one Meridian and Parallel of the Common Chart to the Globe, otherwiſe you will alter the Meridian

Meridian and Parallel of places upon the Globe, as they are transferred from onely one Meridian and Parallel of the Common Chart: In regard the Meridional parts contained in the difference of Latitude, and the Rumb, according to *Mercator*, are onely in proportion to the difference of Longitude in the Equinoctial, in a ſingle Traverſe, but not in the practical part of Navigation, by which the Meridian and Parallel of all the known parts of the World is found.

EXAMPLE.

The ſecond Ship, in her ſecond Traverſe, ſails from C in the Latitude of 65 *d.* 18 *m.* in an Angle of 23 *d.* 56 *m.* 2159 miles or 35 *d.* 59 *m.* into the Latitude of 32 *d.* 25 *m.* Then take with your Compaſs 35 *d.* 59 *m.* the diſtance ſailed from the Equinoctial part of the Globe, placing one Foot in the Meridian and Parallel of the ſecond Ship, in her firſt Traverſe, as it was transferred from the Common Chart

to

the Globe; then turn the Globe Eaſtward, in regard your Ship is gone to the Weſt-ward untill the other Point doth cutt under the Braſs Meridian of the Globe, in the Latitude of 32 *d.* 25 *m.* there make a mark upon the Globe, and you ſhall have 23 *d.* 25 *m.* the difference of Longitude in the Equinoctial, as it was found by *Mercator*'s brief Rules in that ſingle Traverſe, which being added to the difference of Longitude in the Equinoctial, that the ſecond Ship made in her firſt Traverſe from the *Lyzard*, 70 *d.* 20 *m.* You have 93 *d.* 45 *m.* the difference of Longitude in the Equinoctial, Weſt of the Meridian of the *Lyzard*, then ſubtract 69 *d.* 15 *m.* the difference of Longitude in the Equinoctial, the ſecond Ship made in proportion to the difference of Longitude in each ſingle Traverſe in a right lined Triangle, from the *Lyzard*, according to the practical Rules of *Mercator* in each Traverſe, and you have 24 *d.* 30 *m.* that you muſt alter the Meridian and Parallel of the ſecond Ship in the Equinoctial part

part of the Globe, which proves *Mercator's* practical Rules in Navigation to be notoriouſly falſe. In regard *Mercator's* Rules doth diſagree in the practical Part, with the Rumb and the right lines of the Magnetick Compaſs. Therefore as the Meridian and Parallel of places cannot be found by the practical part of Navigation by the Arch of a great Circle, or by the brief Rules of *Mercator*; ſo likewiſe you cannot transfer the Meridian and Parallel of places from the Common Chart to the Globe, but onely from one Meridian and Parallel of the Common Chart, by ſuch Demonſtrations you ſhall have the ſame Latitudes and diſtance of places to all the known parts of the World, upon the Globe, as it is transferred from any one Meridian and Parallel of the Common Chart, otherwiſe the Meridian and Parallel of places cannot be known upon the Globe, as they are found by the practical part of Navigation; therefore the Common Chart, is the onely True Chart in Navigation.

In

In the laſt place.

There have been ſome that pretend to find the difference of Longitude or the difference of Meridians, by Obſervation from the Celeſtial Bodies; firſt I ſhall prove it is not to be found by obſervation from the Stars: Secondly, I ſhall prove it is not to be found by obſervation from the Planets, upon their greateſt inclination or declination into the Equinoctial, without it be when the Sun or Moon be Eclipſed in the Equinoctial.

1. In the firſt place, I ſhall prove the difference of Meridians, or the difference of Longitude cannot be found by obſervation from the Stars.

EXAMPLE.

Suppoſe your ſelf to be in any Meridian and Parallel of the Terreſtial Sphere, there you take the Meridian altitude, of one or more Stars in the Equi-

Equinoctial, or out of the Equinoctial, the Meridian altitude of thoſe Stars: or the altitude of the guards upon their Angles of Poſition with the North Star is the ſame the whole Circulation of the Earth, in that Parallel you made your Obſervations in, ſo that you have no difference of Obſervation to give the difference of Longitude, or the difference of Meridians. Therefore the difference of Longitude, or the difference of Meridians cannot be found by Obſervation, from any of the Stars, without you have difference of Obſervation, to give the difference of Meridians.

2. In the next place, I ſhall prove the difference of Longitude or the difference of Meridians cannot be found by Obſervation, from any of the Planets upon their greateſt inclination or declination into the Equinoctial, or day after day.

Example.

EXAMPLE.

If you obſerve in any Meridian and Parallel of the World, the Meridian altitude of any of the Planets, upon their greateſt inclination or declination into the Equinoctial, or day after day, you will find the difference in your Obſervations, in any one Meridian and Parallel you obſerve in, not to have a proportion to the difference of Longitude or the difference of Meridians with the circulation of the Earth, therefore the difference of Longitude or the difference of Meridians cannot be found by Obſervation from the Meridian altitude of any of the Planets without you have difference of obſervation. In proportion to the difference of Longitude or the difference of Meridians the circulation of the Earth.

3. In the laſt place, I ſhall ſhew you how the difference of Longitude or the difference of Meridians may be found by Obſervation when Eclipſes ſhall

ſhall happen to be in the Equinoctial and not otherwiſe.

EXAMPLE.

If the Sun or Moon be Eclipſed in the Equinoctial, and that ſeveral perſons in ſeveral Meridians and Parallels of the World, doth obſerve the altitude of the Sun or Moon, at the beginning or end of the Eclipſe, theſe Obſervations being compared, the difference of Obſervation between ſuch places, ſhall give the difference of Longitude or the difference of Meridians between thoſe places ſuch Obſervations were made in, In regard the Sun or Moon being Eclipſed in the Equinoctial doth appear at that inſtant of time thoſe Obſervations were taken at the beginning or end of the Eclipſe as a Pole in the Eaſt or Weſt, ſo that the difference of Longitude or the difference of Meridians muſt have

the like proportions by Obſervation from ſuch Eclipſes, to prove the Meridians doth run Parallel to the Eaſt and Weſt part of the Terreſtial Sphere, as the Parallels of Latitude are proved to run Parallel by Obſervation to the Equinoctial and to the North and South Pole of the Terreſtial Sphere, therefore it is a very ſtrange Opinion in any Men to grant the Magnetick Compaſs rectified to his true Poles to run Eaſt or Weſt in all Parallels of Latitude to the Equinoctial, and to the Poles of North and South, and not to grant the Meridians of the Magnetick Compaſs to run Parallel to the Eaſt and Weſt part of the Terreſtial Sphere; in the foregoing Treatiſe, I have proved by Obſervation, that the Magnetick Compaſs in all Meridians and Parallels of the World doth point to the Eaſt and Weſt part of the Celeſtial Sphere, as it points to the North and South part of the Celeſtial Sphere; therefore

as

is the Magnetick Compass makes the same Position to the East and West part of the Celestial Sphere as it doth to the North and South part of the Celestial Sphere, in all Meridians and Parallels of the World: therefore it must be granted that the Magnetick Compass runs in Parallel Meridians, as it runs in Parallels of Latitude upon the Terrestial Sphere; to which the Observations of Eclipses in the Equinoctial, and the Observations from the Poles of the North and South doth agree.

4. In the last place, If the Sun or Moon be not Eclipsed in the Equinoctial, then the altitude of the Sun or Moon being observed in several Meridians and Parallels at the beginning or end of the Eclipse, the difference of such Observations being compared cannot give the difference of Meridians or the difference of Longitude in proportion with the Parallels of Latitude; In regard the Sun or

Moon ſo Eclipſed out of the Equinoctial, ſuch Obſervations cannot croſs the Parallels of Latitude at right Angles: For ſuch Obſervations are as much out of proportion with the Parallels of Latitude, as the Parallel Meridians of the Poles Ecliptick, would be out of proportion with the Parallel Meridians, of the North and South Poles, upon the Terreſtial Sphere. So that the difference of Longitude or the difference of Meridians upon the Terreſtial Sphere, cannot be found by Obſervation from the Stars, or from the Planets, without it be when the Sun and Moon be Eclipſed in the Equinoctial.

To Prove the Earth the Centre of the Starry-Heaven, *and not to have any Inclination towards the Poles, as* Copernicus *would have it.*

THE Earth by Obſervation keeps its Parallels with the Starry-Heaven all the Year, without alteration; for by Obſervation, that Star that is in the Equinoctial part of Heaven, is always in the Equinoctial part of the Earth; ſo likewiſe, take all the Stars in their ſeveral Parallels to the Poles from the Equinoctial, and you will find they keep their Parallels with the Earth for ever.

We need not go to the Equinoctial part of the Earth, to prove the Earth

to keep her Parallels with the Equinoctial part of the Starry Heaven: For, obſerve in this Parallel or Latitude of *London* 51 *d.* 30 *m.* the Amplitude of any Star in the Equinoctial, either upon his Riſing or Setting, and you ſhall find his Amplitude to be Eaſt or Weſt of you for ever, in this Parallel or any other.

Likewiſe obſerve the Meridian Altitude of any Star in the Equinoctial, in this Parallel or in any other Parallel or Latitudes, and you ſhall find his Meridian Altitude to be the Elevation of the Equinoctial for ever, in this Parallel or Latitude, or in any other Parallel or Latitudes.

And by daily Obſervations we find the Sun to alter his Amplitudes, and Meridian Altitudes, and Parallels with the Starry Heaven and the Earth. And we find the Starry Heaven to keep its Parallels with the Earth always, in regard the Stars keep their Meridian Altitudes and Amplitudes with the Earth, without alteration.

But

But if we ſhould admit the Sun the Centre of the Starry Heaven, and the Earth ſhould have her Declination towards her Poles; then the Sun muſt be always in the Equinoctial part of the Starry Heaven; and the Sun muſt have the ſame Amplitudes, and Meridian Altitudes, with the Stars in the Equinoctial, in all Parallels! And then the Sun, and all the Stars in Heaven, ſhould have a daily Calculation of the Declination of the Earth, as the Earth ſhould alter her Parallels, by Inclining or Declining towards her Poles.

But it is proved by Obſervation, that the Sun cannot be the Centre of the Starry Heaven; in regard the Sun is not always in the Equinoctial part of that Heaven, and the Sun hath not the ſame Meridian Altitude, and Amplitude, and Parallels, with the Starry-Heaven in the Equinoctial, but twice in the Year, and that is as the Sun Inclines and Declines from one Tropick to another.

And it is proved by Obſervation, that the Equinoctial part of the Starry-Heaven is always in the Equinoctial part of the Earth, for the Meridian Altitude of the Stars in Equinoctial is the Elevation of the Equinoctial in all Parallels. Now there is a neceſſity, that the Declination of the Sun ſhould be Calculated for every day in the Year, in regard of his Declination towards his Poles 23 *d.* 30 *m.* which is the cauſe the Sun alters his Parallels, and Amplitudes, and Meridian Altitudes every day.

But for Stars in the Starry-Heaven, their Declination or diſtance from the Equinoctial is the ſame for ever, and keeps its Parallels with the Earth, by Obſervation.

Another

Another Example from the Sun, to prove the Earth the Centre of the Starry-Heaven.

MOST *Mathematicians* hold, that when the Sun is depreſſed below the Horizon 15 *d.* that Twylight appears upon the Horizon; the proof of which is very ſutable in this Parallel or Latitude.

EXAMPLE.

London, Latitude 51 *d.* 30. North, the Suns Declination 23 *d.* 30 *m.* North, the Suns Depreſſion 15 *d.* 00 *m.* I demand the Time of Twylight? By the Work you will find the Sun being

ing depreſſed 15 *d.* at Midnight, the 11*th* day of *June*, in the Latitude of 51 *d.* 30. you will have Twylight appear in the North all Night: At which time we find by Obſervation in the Equinoctial, and in this Parallel, and in all other Parallels, the Sun to be diſtant from the North Poles 66 *d.* 30 *m.* Now if the Sun was the Centre of the Starry-Heaven, the Sun would be always diſtant from the Poles 90 *d.* as the Stars in the Equinoctial are, and as the Sun is the 10*th* day of *March*, or the 10*th* day of *September*, when he is in the Equinoctial.

I ſhall add one Obſervation more from the Magnetick Compaſs, as it is Horizontal to prove the Earth the Centre of the Starry-Heaven.

It is granted by all Aſtronomers, that Stars of the leaſt Magnitude, are bigger than the Earth, ſo that the leaſt

leaſt Star appears as a Centre to us upon the Earth; In like manner I ſhall prove the Earth by Obſervation by the Magnetick Compaſs, appears but as a Centre to the Stars, and that the Earth is the Centre of the Starry-Heaven.

EXAMPLE.

The Magnetick Compaſs as it is Horizontal in all Meridians and Parallels of the World rectified to its true Poles, where there is occaſion, doth point to the Stars in the Equinoctial, and to the Eaſt and Weſt, and to the North and South parts of the Celeſtial Sphere, croſſing the Celeſtial Sphere at right Angles, without giving any difference of Obſervation for the Diameter of the Earth, ſo that the Earth appears as a Centre to the Stars and is the Centre of the Starry Heaven, by the Horizontal Obſervations of the Magnetick Compaſs; in regard you have no difference

rence of Observation, for the whole Diameter of the Earth; but if the Earth should incline or decline towards its Poles as *Copernicus* supposed it doth, 23 *d.* 30 *m.* then the Horizontal Observations of the Magnetick Compass cannot point to the Stars in the Equinoctial, or to the East and West part of the Celestial Sphere, for if the Earth, as a Centre should move upon its Axis 23 *d.* 30 *m.* to each Tropick, then the Earth must alter the Equinoctial part of the Starry Heaven, as the Sun and the rest of the Planets doth, therefore *Copernicus* is under a very great mistake, to suppose the Sun the Centre of the Starry Heaven.

In the next place, I shall prove the foregoing position by Observation and by Demonstration, the outward Sphere representing the Starry-heaven the lesser Sphere the Earth.

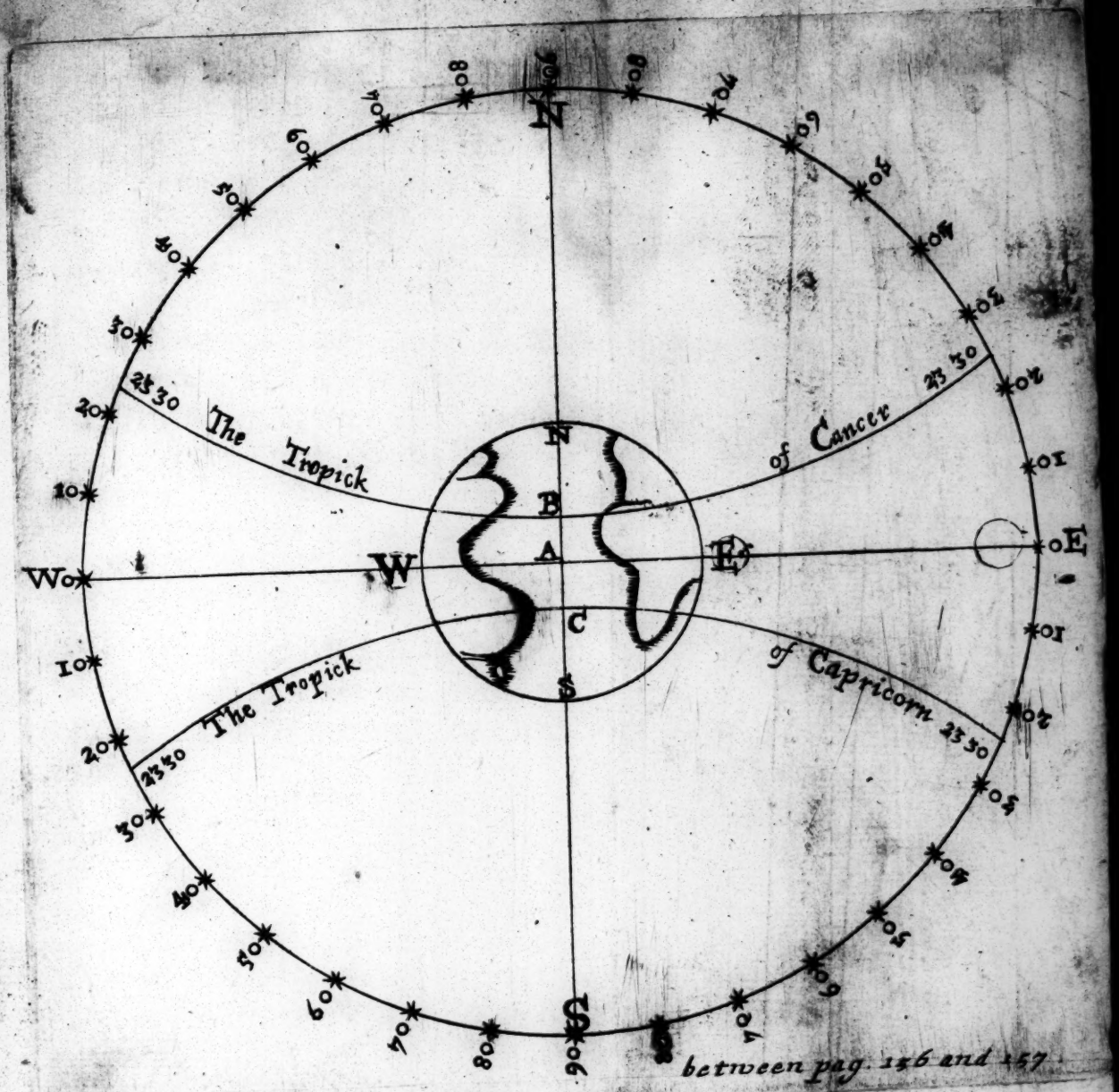
1. To demonstrate the Earth to be the Centre of the Starry Heaven. If the

the Earth ſhould move upon its Axis 23 *d.* 30 *m.* towards the North or South Poles, then there is a neceſſity the Earth muſt alter its Parallels with the Sun and the Stars in the Equinoctial part of Heaven, 23 *d.* 30 *m.* but on the contrary it is proved by Obſervation in all Meridians and Parallels of the World, that A is always in the Equinoctial part of the Starry-Heaven, and that B is always in the Tropick of *Cancer*; and that C is always in the Tropick of *Capricorn*, ſo that the Earth always keeps its Parallels with the Starry-Heaven without alteration; therefore the Earth is the Centre of the Starry-Heaven.

2. If the Sun ſhould be the Centre of the Starry-Heaven, according to *Copernicus*'s ſuppoſition; then the Sun by Obſervation ſhould be always in the Equinoctial part of the Starry-Heaven, as it is the tenth day of *March*, and the tenth day of *September*, at which time the Sun is by Obſervation diſtant from

from the Poles, 90 *m.* but on the contrary the Sun is by Obſervation when he is in the Tropicks 66 *d.* 30 *m.* diſtant from the Poles; therefore the Sun doth alter its place in the Ecliptick with the Conſtellations of the Starry-Heaven, by inclining from the Tropick of *Capricorn*, to the Tropick of *Cancer* 47 *d.* ſo that the Sun cannot be the Centre of the Starry-Heaven but by ſuppoſition.

3. By the Horizontal Obſervation of the Magnetick Compaſs, the Earth appears as a Centre to the Equinoctial part of the Starry-Heaven, therefore if the Earth as a Centre to the Starry-Heaven ſhould move upon its Axis from A to B, in the Tropick of *Cancer*, and ſo back-again to the Equinoctial, and from thence to C, in the Tropick of *Capricorn*, then the Earth as a Centre muſt alter its Parallels with the Starry-Heaven, from the Tropick of *Cancer*, to the Tropick of *Capricorn*, which is 47 *d.* but on the contrary, the



between pag. 156 and 157.

the Earth by Obſervation by the Magnetick Compaſs is the Centre of the Starry Heaven, and keeps its Parallels with the Starry Heaven, without alteration, otherwiſe the Earth muſt alter its Amplitudes with the Equinoctial part of the Starry-Heaven, as all the Planets doth: So that the Earth is the Centre of the Starry-Heaven, and there is no Obſervation to be made from the Celeſtial Bodies to prove the Earth has any motion at all.

What I have offered to the World in this ſmall Treatiſe, I have proved by Obſervation and Demonſtration; therefore whatever Men may pretend to, if they do not accord with the like Rules, it is but Fancy or Imagination.

FINIS.

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